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AMERICAN ANTIQUITY

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HISTORY AND DISTRIBUTION OF THE CULTIVATED CUCURBITS IN THE AMERICAS

HUGH C. CUTLER AND THOMAS W. WHITAKER

ABSTRACT

All species of *Cucurbita* (which includes squashes, pumpkins, and the common, small, yellow-flowered gourds) are native to the Americas. Their center of origin lies in Mexico where most of the 26 wild and cultivated species still grow. Chilicayote (*C. ficifolia*), a perennial and probably the oldest cultivated species, is grown from Mexico to Bolivia and known archaeologically only from coastal Peru (3000 B.C.). Oldest archaeological cucurbits are *C. pepo* and *Lagenaria siceraria*, the bottle gourd. Specimens of these species were recovered from Tamaulipas in cave material dated 7000–5500 B.C. Pepo and *Lagenaria* spread over most of the United States probably with the advent of agriculture. *Cucurbita moschata* appeared in coastal Peru at the same time as *C. ficifolia* (3000 B.C.), but it does not occur in the Ocampo Cave cultures until 1400–400 B.C. when pottery and village life entered, and corn, cotton, pepo, and beans (common, lima and jack) were being grown. While the earliest dates for moschata in southwestern United States are about A.D. 1100, it probably entered the same time as cotton, perhaps as early as A.D. 700. *Cucurbita mixta*, the cushaw, is the most recent of the cultivated species. It is found mainly in Mexico and in post-A.D. 1000 sites in the southwestern U.S. Prehistoric *C. maxima* is known only from Peru and to the south and east in Chile and Bolivia. Its ancestors probably were carried there by man from the Mexican center, and the weedy *C. andreana* may have been taken along at the same time.

The bottle gourd is most variable in the Old World. It probably originated there, and was carried to the New World in pre-agricultural times by ocean currents. A number of other cucurbits and the tree gourd, *Crescentia cujete*, not a true gourd but a member of the family Bignoniaceae, are briefly mentioned. Parts useful in identifying the cultivated cucurbits are the fruit stem or peduncle, seeds, rind, and leaves. A list of the collections of *Cucurbita* and *Lagenaria* which have been studied is given, with estimates for the date of each site.

THERE is a vast amount of evidence to indicate that species of two genera in the Cucurbitaceae, namely *Cucurbita* (pumpkins and squashes) and *Lagenaria* (gourds) had an important role in pre-Columbian agriculture. This evidence in the form of seeds, rinds, and peduncles has been excavated from a great many archaeological sites in the Western Hemisphere. The material, most of it well documented, has accumulated in museums in this country and Latin America. It has never been thoroughly studied with the purpose of determining the pattern of distribution of the species involved in time and area, their importance in the economy of the native peoples, and their association with other crop plants. It is the aim of this report to record the facts we have gathered in a systematic attempt to answer these questions.

Squashes and gourds may have been the earliest domesticated plants of the New World. They are found with beans at levels which are older and lie below those in which corn is found at two sites: Huaca Prieta on the north coast of Peru (Whitaker and Bird 1949) and the Ocampo Caves of Tamaulipas, Mexico (Whitaker, Cutler, and MacNeish 1957). Squashes and gourds of coastal Peru are dated before 3000 B.C. while in the Ocampo Caves some specimens were found in the Infiernillo culture deposits tentatively dated 7000–5500 B.C. It is likely that these very early Mexican specimens represent wild, weedy plants or camp-followers, for there is little evidence of agriculture at that time.

PUMPKIN, SQUASH, AND GOURD

The terms pumpkin and squash are of no value in distinguishing species of *Cucurbita*. The common New England pumpkin, White Bush Scallop squash, Italian or Zucchini squash, Summer Crookneck squash, and Acorn squash, for example, are all cultivars of the same species, *C. pepo* L., while Kentucky Field Pumpkin and Butternut squash are cultivars of *C. moschata* Poir. As a rule pumpkins are coarse and strongly flavored fruits of any species of *Cucurbita* utilized when ripe as forage, as a table vegetable, or in pies. Squashes are finer textured, milder flavored cultivars used immature or when mature, baked, boiled, or in pies, less commonly used as

feed for livestock. To facilitate discussion we use the specific name as the common name.

The word gourd usually refers to the bottle gourd, *Lagenaria siceraria* (Mol.) Standl., and when other gourds are mentioned here they are described, for example, the small pepo gourd (*Cucurbita pepo* var. *ovifera* Alef.), or the buffalo gourd (*C. foetidissima* HBK.). Several tropical trees bear fruits which are often used for containers or musical instruments and are called gourds. Most common is *Crescentia cujete* L., usually called the calabash tree or gourd tree. It is, however, a member of the Bignoniaceae, the family to which the catalpa and trumpet creeper belong. These tropical tree fruits should be called tree gourds to distinguish them from the true gourds of the gourd family, Cucurbitaceae.

Distribution

In pre-Columbian times the cucurbits were more important than any other group of cultivated plants in the New World except corn. As would be expected, their importance varied with different cultures and in different areas. Apparently they were unknown to some cultures in locations where they could have been grown successfully, while in a few other areas, because of the limitations of soil, climate, and other factors, the plants could not be grown.

The center of distribution of the 26 species of the genus *Cucurbita* is in central and northern Mexico (see Table 1). Only the cultivated species *C. maxima* Duch., *C. moschata*, *C. ficifolia* Bouché, the weedy *C. andreana* Naud., and the wild *C. lundelliana* Bailey, have spread southward beyond Mexico. As the genus moved northward into the dry plateaus and deserts of northern Mexico and the southwestern United States, many xerophytic species evolved, some with peculiar adaptations that have fitted them for survival in these rugged habitats. All species of *Cucurbita* are strictly New World plants. Not a single specimen, report, or illustration dated prior to 1492 has ever been found in the Old World. There is ample evidence from the distribution of the wild species and the abundant remains in archaeological sites that the squashes, pumpkins, and their wild relatives have had a long history of association with man in the New World (Table 2).

Uses of the *Cucurbita*

There are reliable reports and collections which show that the seeds and fruits of several of the wild squashes have been used for food. The fruits of all of the wild species, listed in Table 1, are somewhat similar so it is likely that most of them were used for food. The wild species with the widest distribution and the one most frequently seen in collections from living Indians or from archaeological sites is *Cucurbita foetidissima*, the buffalo gourd, coyote melon, or calabazilla (Fig. 1). All parts of this plant usually are so bitter and obnoxious to taste and smell that some form of treatment is required

Table 1. Non-Cultivated Species of *Cucurbita**

Species	*Present Distribution*
Species which are mainly annual and grow in moist areas	
C. texana Gray	Central and southern Texas
C. sororia Bailey	Southern Mexico
C. fraterna Bailey	Northeastern Mexico
C. radicans Naud.	About Mexico City
C. okeechobeensis Bailey	Lake Okeechobee, Florida
C. martinezii Bailey	State of Veracruz, Mexico
C. pedatifolia Bailey	State of Querétaro, Mexico
C. lundelliana Bailey	British Honduras; Department of Petén, Guatemala; Southeastern Mexico
C. palmeri Bailey	Northwestern Mexico
C. gracilior Bailey	Southern Mexico
C. andreana Naud.	Uruguay, Argentina, Bolivia
C. kellyana Bailey	State of Jalisco, Mexico
C. moorei Bailey	State of Hidalgo, Mexico
Species which are mainly perennial and grow in dry areas	
C. foetidissima HBK.	Central Mexico to California, Arizona, Nevada, Utah, eastward to Nebraska and Missouri
C. cordata Wats.	Baja California, Mexico
C. cylindrata Bailey	Baja California, Mexico
C. digitata Gray	Southern New Mexico, Arizona and California, and Sonora, Mexico
C. palmata Wats.	Southwestern Arizona, southern California and adjacent Baja California
C. californica Torr. ex Wats.	Southwestern Arizona, southern California and adjacent Baja California
C. galeottii Cogn.	State of Oaxaca, Mexico
C. scabridifolia Bailey	Southern Tamaulipas, Mexico

* Bailey 1943, 1948.

TABLE 2. A SELECTED LIST OF CUCURBIT MATERIAL FROM ARCHAEOLOGICAL SITES IN THE AMERICAS. LISTED CHRONOLOGICALLY FOR EACH SPECIES

Site	Approximate Date	Plant Parts Identified		
		Peduncle	Seeds	Rind
Wild *Cucurbita*				
Ocampo Caves, Tamaulipas, Mexico	7000 B.C.–A.D. 1750		x	x
Cordova Cave, New Mexico	300 B.C.–A.D. 1200	x	x	x
Tularosa Cave, New Mexico	300 B.C.–A.D. 1200	x	x	x
O–Block Cave, Reserve, New Mexico	? B.C.–A.D. 1150		x	x
Pueblo II Rockshelters, Clark County, New Mexico	A.D. 900–1050		x	x
Gourd Cave, near Betatakin, Arizona	?			x
Glen Canyon (numerous sites), Arizona and Utah	A.D. 1050–1250	x	x	x
Montezuma Castle, Arizona	A.D. 1100–1150	x	x	x
Hinkle Park, Reserve, New Mexico	A.D. 1100–1200			x
Kiet Siel, Arizona	A.D. 1100–1284			x
Higgins Flat, Reserve, New Mexico	A.D. 1175–1250		x	x
Rock Shelter, Lincoln County, New Mexico	A.D. 1200–1300			x
Roaring River State Park, Missouri	A.D. 1200–1500		x	
Awatovi, Arizona	A.D. 1213–1700		x	x
Arizona W:10:50, Point of Pines, Arizona	A.D. 1250	x	x	x
Cosper Cliff Cave, Reserve, New Mexico	A.D. 1275–1300			x
Arizona W:9:72, Red Bow Cliff Dwelling, Point of Pines, Arizona	A.D. 1275–1400			x
Gila Pueblo, Arizona	A.D. 1345–1385			x
Tonto Upper Ruin, Arizona	A.D. 1346	x		x
Fort Randall Reservoir, South Dakota	A.D. 1700		x	
Walapai, Arizona	A.D. 1900		x	x
Cucurbita pepo				
Ocampo Caves, Tamaulipas, Mexico	7000 B.C.–A.D. 1750	x	x	x
Cordova Cave, New Mexico	300 B.C.–A.D. 1200	x	x	
Tularosa Cave, New Mexico	300 B.C.–A.D. 1200	x	x	
O–Block Cave, Reserve, New Mexico	? B.C.–A.D. 1150	x	x	x
Falls Creek, Colorado	A.D. 174–945		x	
Mummy Cave, Canyon del Muerto, Arizona	A.D. 380–1284	x	x	
Smith Creek Cave, White Pine County, New Mexico	A.D. 600– ?		x	
Antelope Cave, Northern Arizona	A.D. 700–900		x	
Yampa Canyon Caves, Yampa Canyon, Colorado	A.D. 690–1000	x	x	x
Cave Valley, Chihuahua, Mexico	A.D. 900–1000	x	x	
Pueblo II Rockshelters, Clark County, New Mexico	A.D. 900–1050		x	
Chetro Ketl, Chaco Canyon, New Mexico	A.D. 911–1116		x	x
Walnut Canyon, Arizona	A.D. 911–1256		x	
Bone Awl House, Mesa Verde, Colorado	A.D. 958–1187	x		x
Gourd Cave, near Betatakin, Arizona	?		x	
Glen Canyon (numerous sites), Arizona and Utah	A.D. 1050–1250	x	x	x
Canyon de Chelly, Arizona	A.D. 1058–1275		x	
Square Tower House, Mesa Verde, Colorado	A.D. 1066–1246	x		x
Room 25, Wupatki National Monument, Arizona	A.D. 1070–1205		x	
Montezuma Castle, Arizona	A.D. 1100–1150	x		
Aztec Ruins National Monument, New Mexico	A.D. 1110–1125			x
Hinkle Park, Reserve, New Mexico	A.D. 1100–1200	x	x	
Kiet Siel, Arizona	A.D. 1100–1284	x		
Various sites in Missouri, Illincis, Iowa, South Dakota, Kansas, and Oklahoma	A.D. 1100–1800	x	x	
Higgins Flat, Reserve, New Mexico	A.D. 1175–1250		x	
Kin Kletso, Chaco Canyon, New Mexico	A.D. 1179	x		x
Roaring River State Park, Missouri	A.D. 1200–1500		x	x
Durango, Mexico	A.D. 1200–1900	x		
Awatovi, Arizona	A.D. 1213–1700	x	x	
Betatakin Ruin, Arizona	A.D. 1242–1276	x		x
Arizona W:10:50, Point of Pines, Arizona	A.D. 1250	x		
Tower Unit, Mummy Cave, Canyon de Chelly, Arizona	A.D 1251–1284	x		
Kokopnyama, Jeddito Valley, Arizona	A.D. 1254–1495		x	
Cosper Cliff Cave, Reserve, New Mexico	A.D. 1275–1300	x	x	

Table 2. A Selected List of Cucurbit Material from Archaeological Sites in the Americas. Listed Chronologically for each Species (continued):

Site	Approximate Date	Plant Parts Identified		
		Peduncle	Seeds	Rind
Arizona W:9:72, Red Bow Cliff Dwelling, Point of Pines, Arizona	A.D. 1275–1400	x	x	
Sunny Glen, Cave 2, Chisos Mountains, Texas	A.D. 1300 ?		x	
Canyon Creek Ruin, Arizona	A.D. 1323–1347	x		
Jemez Cave, New Mexico	A.D. 1325–1657	x	x	x
Gila Pueblo, Arizona	A.D. 1345–1385	x		
Tonto Upper Ruin, Arizona	A.D. 1346	x		
Walker-Gilmore Site, Nebraska	A.D. 1400–1500		x	x
Whitehall, Michigan Lower Peninsula	A.D. 1500		x	
Sheep Rock Shelter, Huntingdon County, Pennsylvania	A.D. 1570	x	x	x
Oahe Reservoir, South Dakota	A.D. 1700–1750		x	
Phillips Ranch, South Dakota	A.D. 1700–1800		x	
Garrison Reservoir, North Dakota	A.D. 1825–1837		x	
Walapai, Arizona	A.D. 1900	x	x	
San Ildefonso Pueblo, New Mexico	modern		x	
Tesuque Pueblo, New Mexico	modern	x	x	x
Taos Pueblo, New Mexico	modern	x	x	x
Omaha Indians, Nebraska	modern		x	
Arikara Indians, North Dakota	modern		x	
Cucurbita moschata				
Huaca Prieta, Chicama, Peru	3000–1000 B.C.	x	x	x
Ocampo Caves, Tamaulipas, Mexico	1850 B.C.–A.D. 1750	x	x	x
Uaxactún, Department of Petén, Guatemala	A.D. 900	x		
Pueblo II Rockshelters, Clark County, New Mexico	A.D. 900–1050	x		
Montezuma Castle, Arizona	A.D. 1100–1150	x	x	x
Kiet Siel, Arizona	A.D. 1100–1284		x	
Arizona W:10:50, Point of Pines, Arizona	A.D. 1250	x	x	
Cosper Cliff Cave, Reserve, New Mexico	A.D. 1275–1300	x		
Arizona W:9:72, Red Bow Cliff Dwelling, Point of Pines, Arizona	A.D. 1275–1400	x	x	
Chincha, Peru	A.D. 1300–1530		x	
Canyon Creek Ruin, Arizona	A.D. 1323–1347	x		
Tonto Upper Ruin, Arizona	A.D. 1346	x	x	x
Oahe Reservoir, South Dakota	A.D. 1700–1750		x	
Garrison Reservoir, North Dakota	A.D. 1825–1837		x	
Omaha Indians, Nebraska	modern		x	
Arikara Indians, North Dakota	modern		x	
Pawnee Indians, Oklahoma	modern		x	
Cucurbita mixta				
Ocampo Caves, Tamaulipas, Mexico	A.D. 150–1050	x	x	
Ventana Cave, Arizona	? –A.D. 900		x	
Cave Valley, Chihuahua, Mexico	A.D. 900–1000	x		
Pueblo II Rockshelters, Clark County, New Mexico	A.D. 900–1050		x	x
O-Block Cave, Reserve, New Mexico	A.D. 900–1000		x	
Walnut Canyon, Arizona	A.D. 911–1256			x
Gourd Cave, near Betatakin, Arizona	?		x	
Glen Canyon (numerous sites), Arizona and Utah	A.D. 1050–1250	x	x	x
Room 25, Wupatki National Monument, Arizona	A.D. 1070–1205		x	
Montezuma Castle, Arizona	A.D. 1100–1150	x	x	x
Hinkle Park, Reserve, New Mexico	A.D. 1100–1200		x	x
Higgins Flat, Reserve, New Mexico	A.D. 1175–1250		x	
Rock Shelter, Lincoln County, New Mexico	A.D. 1200–1300	x	x	
Awatovi, Arizona	A.D. 1213–1700	x	x	
Betatakin Ruin, Arizona	A.D. 1242–1276	x		
Arizona W:10:50, Point of Pines, Arizona	A.D. 1250	x	x	x

TABLE 2. A SELECTED LIST OF CUCURBIT MATERIAL FROM ARCHAEOLOGICAL SITES IN THE AMERICAS. LISTED CHRONOLOGICALLY FOR EACH SPECIES (CONTINUED):

Site	Approximate Date	Plant Parts Identified: Peduncle	Seeds	Rind
Tower Unit, Mummy Cave, Canyon de Chelly, Arizona	A.D. 1251–1284	x		x
Cosper Cliff Cave, Reserve, New Mexico	A.D. 1275–1300	x	x	
Arizona W:9:72, Red Bow Cliff Dwelling, Point of Pines, Arizona	A.D. 1275–1400	x	x	x
Canyon Creek Ruin, Arizona	A.D. 1323–1347	x		
Tonto Upper Ruin, Arizona	A.D. 1346	x	x	x
Walapai, Arizona	A.D. 1900	x	x	
San Ildefonso Pueblo, New Mexico	modern		x	
Tesuque Pueblo, New Mexico	modern		x	
Taos Pueblo, New Mexico	modern	x	x	x
Pawnee, Oklahoma	modern		x	
Cucurbita maxima				
Ica Valley, Ocucaje, Peru	A.D. 600		x	
San Nicolas, near Supe, Peru	A.D. 1200		x	
Ica Valley, Chulpaca, Site M, Peru	A.D. 1300–1400		x	
Taos Pueblo, New Mexico	modern	x	x	x
Omaha Indians, Nebraska	modern		x	
Arikara Indians, North Dakota	modern		x	
Pawnee Indians, Oklahoma	modern		x	
Lagenaria siceraria				
Ocampo Caves, Tamaulipas, Mexico	7000 B.C.–A.D. 1750	x	x	x
Huaca Prieta, Chicama, Peru	3000–1000 B.C.	x	x	x
Cordova Cave, New Mexico	300 B.C.–A.D. 1200	x		x
Tularosa Cave, New Mexico	300 B.C.–A.D. 1200	x		x
O–Block Cave, Reserve, New Mexico	A.D. 150–500			x
Mummy Cave, Canyon del Muerto, Arizona	A.D. 380–1284			x
Vandal Cave, Arizona	A.D. 608–683			x
Step House, Mesa Verde, Colorado	A.D. 610			x
Antelope Cave, Northern Arizona	A.D. 700–900			x
Cave Valley, Chihuahua, Mexico	A.D. 900–1000			x
Pueblo II Rockshelters, Clark County, New Mexico	A.D. 900–1050	x		x
Chetro Ketl, Chaco Canyon, New Mexico	A.D. 911–1116			x
Walnut Canyon, Arizona	A.D. 911–1256			x
Bone Awl House, Mesa Verde, Colorado	A.D. 958–1187			x
Gourd Cave, near Betatakin, Arizona	?			x
Glen Canyon (numerous sites), Arizona and Utah	A.D. 1050–1250	x	x	x
Square Tower House, Mesa Verde, Colorado	A.D. 1066–1246			x
Montezuma Castle, Arizona	A.D. 1100–1150			x
Aztec Ruins National Monument, New Mexico	A.D. 1110–1125			x
Hinkle Park, Reserve, New Mexico	A.D. 1100–1200			x
Various sites in Missouri, Illinois, Iowa, South Dakota, Kansas, and Oklahoma	A.D. 1100–1800			x
Higgins Flat, Reserve, New Mexico	A.D. 1175–1250		x	
Roaring River State Park, Missouri	A.D. 1200–1500			x
Durango, Mexico	A.D. 1200–1900			x
Betatakin Ruin, Arizona	A.D. 1242–1276			x
Arizona W:10:50, Point of Pines, Arizona	A.D. 1250	x	x	x
Cosper Cliff Cave, Reserve, New Mexico	A.D. 1275–1300	x	x	
Canyon Creek Ruin, Arizona	A.D. 1323–1347		x	x
Jemez Cave, New Mexico	A.D. 1325–1657			x
Tonto Upper Ruin, Arizona	A.D. 1346			x
Sheep Rock Shelter, Huntingdon County, Pennsylvania	A.D. 1570	x	x	x
Walapai, Arizona	A.D. 1900			x

Fig. 1. Leaf and fruit of *Cucurbita foetidissima*, x ¼.

before they can be eaten. The seeds were gathered by many Indian groups and roasted or boiled; the young fruits are reported to have been boiled repeatedly, often with some ashes, before being consumed; and the pulp of the fruits was used as a detergent for cleaning and scouring. Pieces of the large starchy roots of wild *Cucurbita* found in Tularosa Cave suggest the roots were also used for food. The roots of another cucurbit, the native, cultivated chayote, *Sechium edule* Sw., are used for food today in Mexico and Guatemala. Notes by Edmund Nequatwa, a Hopi Indian, on two herbarium sheets of foetidissima flowers in the Museum of Northern Arizona say, "Used as food. Cornmeal cake dropped inside blossom and baked."

Practically all wild gourds are native to the Southwest, Mexico, and northern Central America. The only exceptions are *Cucurbita okeechobeensis* Bailey, collected several times on the east shore of Lake Okeechobee, Florida, where it grows over bushes and trees, and *C. andreana*, a weed of Argentina and Bolivia, probably brought in by man with the cultivated *C. maxima*. Several of the squashes cultivated in Bolivia and Argentina appear to be hybrids of andreana and maxima and similar forms have resulted from crosses made by Whitaker in California (unpublished data).

The primary use of the cultivated *Cucurbita* by the native American peoples was for food. There are a few records of the use of the boiled or fried flowers for food by modern Indians. Many records of the use of young fruits, and the frequency of immature fruit stems (peduncles) suggest that the use of green fruits is an ancient one. Mature fruits were eaten when harvested or were stored. Travelers among the Indians of South, Central, and North America describe the storage of entire fruits as well as dried or cooked strips or rings of flesh.

A far less important use of cultivated *Cucurbita* was for containers, ornaments, rattles, and musical instruments. The bottle gourd *Lagenaria siceraria*, is the most common container, but the fruits of hard-shelled, edible *Cucurbita* (the squashes and pumpkins), ornamental yellow-flowered gourds, a botanical variety of *C. pepo*, and the fruits of some wild species of *Cucurbita* have often been used for this purpose.

Plant Parts Needed for Identification of Archaeological Specimens

The quality and quantity of the archaeological specimens of cucurbits varies tremendously with the type of site from which the materials have been excavated. Plant parts of cucurbits are preserved *only* in comparatively dry sites. Characteristically, open sites yield only carbonized materials which are not nearly as satisfactory for identification as uncharred material.

The best preserved materials in North America come from the Great Plains area, the Southwestern United States, and contiguous areas in Northern Mexico. East of the Mississippi River and along the Gulf Coast of United States increased precipitation and few dry caves have severely limited the preservation of plant parts of these species. Presumably for the same reasons, there are few cucurbitacous specimens from Central America. Along the coast of Peru, archaeologists have excavated a number of sites from which specimens of *Cucurbita* and *Lagenaria* were recovered in significant quantities.

The *peduncles* are frequently preserved intact and even when charred, broken or eroded they can be identified with a great deal of precision. Taken by themselves, they are the single, most useful tool available for identifying archaeological specimens of *Cucurbita* and *Lagenaria* at the species level (Fig. 2).

The *seeds* can be used to identify species, if mature, and not seriously damaged by abrasion, shrinking, and decay. Carbonized seeds can also

be used for purposes of identification, if handled with reasonable care. When exposed to temperatures high enough to heat or char them, the seeds swell or puff but remain intact, and their relative dimensions are the same. A wide range of experience and expert judgment is required to identify seeds. A good collection of seeds of modern varieties is helpful for comparison and for checking determinations. However, seed morphology is distinctive enough for most specimens to separate them into species with considerable accuracy (Figs. 3, 4). The distinctive characteristics of the peduncles and seeds of the cultivated *Cucurbita* are itemized in Table 3.

The *rinds* are helpful for purposes of identification, but with limitations. Those of *Lagenaria* can be told from *Cucurbita*, but at present we have no macroscopic or microscopic techniques that will distinguish between the different species of *Cucurbita*. There are one or two, perhaps more, exceptions to this general statement. An occasional neck fragment of *C. mixta* can be identified by the longitudinal lines of corky outgrowth on the surface of the rind. The thin paper-like, and frequently twisted rind fragments of *C. foetidissima* are characteristic for this species. Cultivars of *C. pepo* with roughened or warted skin can be identified from rind

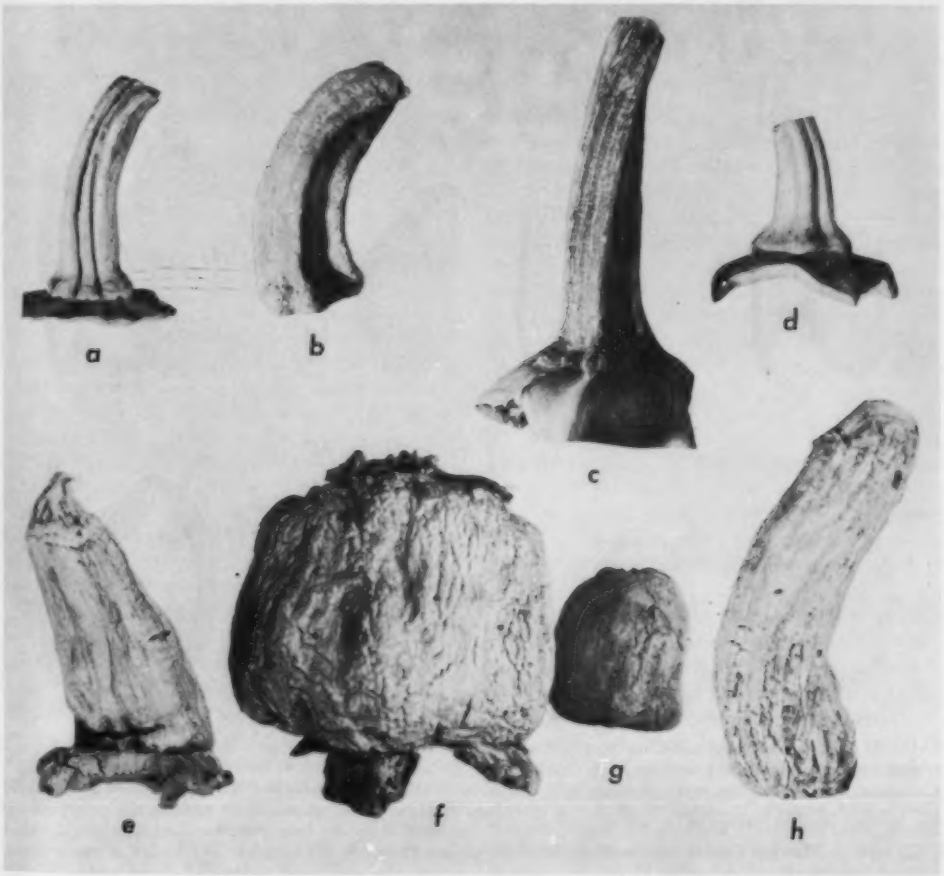

FIG. 2. Peduncles or fruit stems of various cucurbits, x ½. *a, Cucurbita ficifolia; b, C. pepo* from a Pueblo III site in Glen Canyon, Utah; *c, C. pepo* cultivar Early Field Pumpkin; *d, C. moschata* from Guatemala; *e, C. mixta* cv. Green Striped Cushaw; *f, C. mixta* cv. Japanese Pie; *g, C. mixta* from a Pueblo III site in Glen Canyon, Utah; *h, C. maxima* cv. Hubbard.

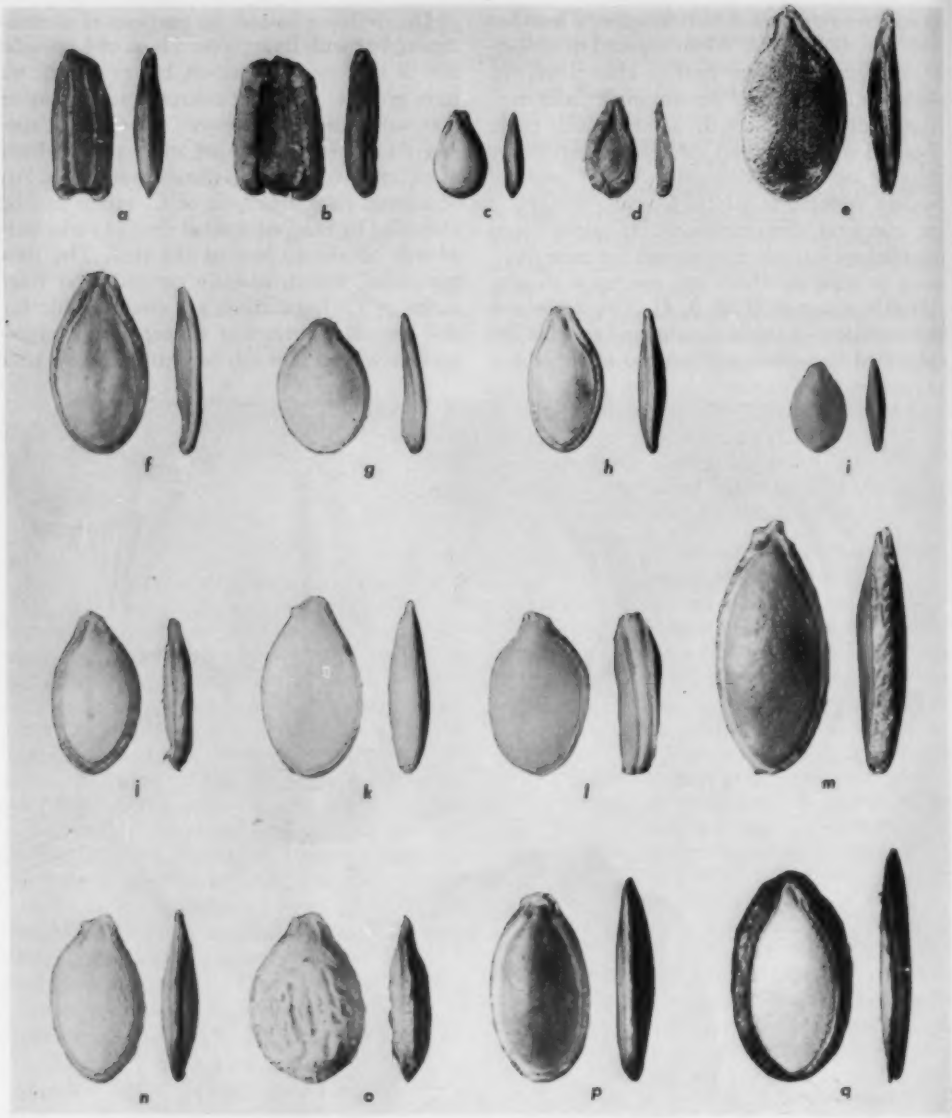

Fig. 3. Seeds of *Lagenaria* and *Cucurbita*, face and edge views, x 1.5. *a*, *Lagenaria siceraria*, narrow, slender type typical of seeds from Africa and the New World; *b*, *L. siceraria*, broad, corky, winged type common in Asia; *c*, *Cucurbita foetidissima*, the most common wild *Cucurbita* of the United States and northern Mexico; *d*, *C. Lundelliana*, a wild species of *Cucurbita* which can be hybridized with cultivated species; *e*, *C. ficifolia*, the only perennial species of the cultivated *Cucurbita*; *f*, *C. pepo* cultivar Connecticut Field, the large pumpkin used for jack-o'-lanterns; *g*, *C. pepo* cv. Mandan, a small cultivar of the North American Plains; *h*, *C. pepo* cv. Red Lodge, a medium-sized cultivar from the North American Plains; *i*, *C. pepo* var. *ovifera*, the small, yellow-flowered gourd, grown in many sizes and shapes as an ornamental; *j*, *C. moschata* cv. Dickinson's Field Pumpkin, a cultivar commonly grown in Kentucky and to the southeast, and similar to many fruits seen in Mexico; *k*, *C. maxima* cv. Hubbard, one of the white-seeded group of maximas; *l*, *C. maxima* cv. Mexican Banana, one of the tan-seeded Banana group; *m*, an unnamed South American cultivar of *C. maxima* with light brown seeds and pale gold margins; *n*, *C. mixta* cv. Green Striped Cushaw; *o*, *C. mixta* cv. Japanese Pie, an extreme of the Green Striped Cushaw group; *p*, *C. mixta* cv. Taos; *q*, *C. mixta*, a Mexican cultivar of the silver-seed group.

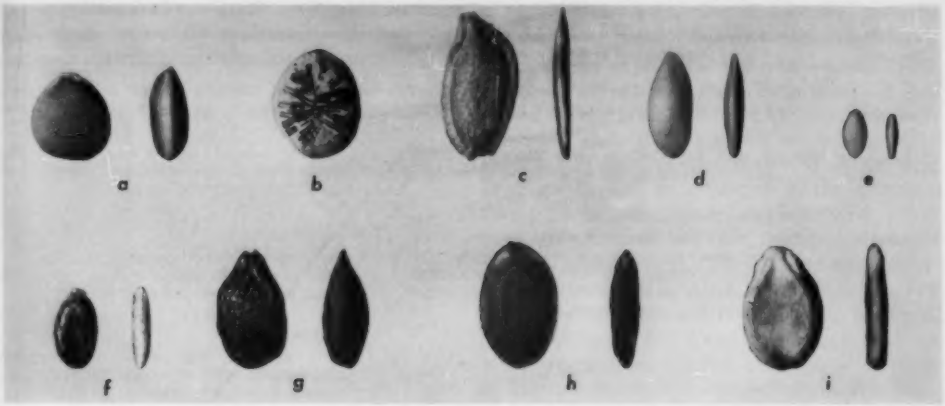

FIG. 4. Seeds of various cucurbits, x 1.5. *a, Apodanthera undulata*, coyote melon; *b, A. undulata*, seed marked by rodent teeth; *c, Sicania odorifera*; *d, Cucumis melo*, muskmelon; *e, C. anguria*, gherkin; *f, Luffa operculata*; *g, L. cylindrica*, dishrag gourd or vegetable sponge; *h, L. acutangula*; *i, Citrullus vulgaris*, watermelon.

fragments. The rind characters of *Lagenaria*, *Crescentia* and the cultivated *Cucurbita* are enumerated in detail in Table 4 (Fig. 5).

If the fruits of *Cucurbita* (Figs. 6, 7) were processed in the field for food, it is evident there would be no plant parts preserved in the shelters or other dwelling places. Except for the peduncles this would also be true when the fruits were carried to the dwellings and consumed in the immature state. Where plant remains of *Cucurbita* are found, it is assumed the fruits were transported to the living quarters, and probably stored for a period of time before being eaten. *Lagenaria* is sometimes used for food in the immature state, but the poor quality and low food value of the product suggests this was not a very popular or widespread use. More often the fruits were permitted to mature on the vine, allowed to harden in storage, then made into numerous household and other necessities.

Most of our determinations will probably remain unchanged, but there are many borderline identifications that cannot be considered final, and will doubtless be altered as our techniques become more refined and increase in precision. In the future we should be able to distinguish cultivars and to trace the origin and movement of many kinds of cucurbits with far greater precision than is possible with the relatively crude methods of today.

HISTORY OF THE CULTIVATED PUMPKINS AND SQUASHES

Cucurbita ficifolia Bouché, the chilicayote of Mexico, is a perennial, like many of the wild *Cucurbita*. It has large, watermelon-shaped, green and white, or white fruits, and flat, black or dark-brown, and sometimes dingy white seeds (Fig. 3). It is grown in Mexico and the Caribbean as far south as Bolivia, usually in the cool highlands and valleys. The perennial habit, certain characteristics of the fruit stem, the comparative ease with which it will cross with other cultivated species, and its occurrence in the preceramic, premaize, lower levels of Huaca Prieta in north central, coastal Peru (dated at about 3000 B.C., Whitaker and Bird 1949) suggest that it is the oldest of the five cultivated species. Thus far we have identified no other archaeological specimens of ficifolia but we have seen relatively few collections of plant materials from the regions in which it grows. Ficifolia clearly stands apart from the four annual cultivated species, but has certain similarities to some of the wild species.

The oldest cultivated squash remains we have seen are from the Ocampo Caves (Whitaker, Cutler and MacNeish 1957) and date back to the very beginnings of agriculture in this region (see Table 2). Small *Cucurbita pepo* seeds from the lowest level, the Infiernillo culture (7000–5500 B.C.), may have come from weeds, or camp-follower plants, instead of true cultivated plants, but by the time of the second period, the Ocampo culture (4050 B.C.), pepo certainly was cultivated and a considerable number of specimens from this period have been studied. Pepo probably originated in northern Mexico because a botanical variety (C. *pepo* var. *ovifera*) of

TABLE 3. DISTINCTIVE CHARACTERISTICS OF PEDUNCLES AND SEEDS OF THE CULTIVATED *Cucurbita*

Species	*Peduncle (fruit stem) Characters*	*Seed Characters*
C. pepo	hard; usually with deep furrows; flaring slightly or not at all at base; roughened by coarse setae	light colored; smooth; margin and body same color; variable in size, from 7 mm. to 26 mm.
C. moschata	hard; with fine shallow, smoothly-rounded furrows; widely expanded, and flaring at the base	usually light colored; with a thin, ragged, often wavy or fringed, deeper-colored margin; body often slightly sculptured or pitted
C. mixta	hard; corky and distorted when mature, somewhat moschata-like when young; roughly cylindrical in shape, often with five smooth longitudinal lines running towards thickened ridges on fruit; usually not expanded at base	seeds of three kinds: Green-striped Cushaw group body white, soft, usually split in various patterns, margins rounded and white Taos group body tan or brown; usually hard, smooth, occasionally split or sculptured; margin threads adhering together or, by wear, separated Silver-seed group body usually white, somewhat soft; margin greatly enlarged, silvery-green or silvery-blue
C. maxima	soft, spongy-corky; almost cylindrical, usually contracted at base	seeds of three kinds: Hubbard group white, plump; margin white and smooth Banana Group body dull tan to light brown; smooth to sculptured; plump; margin lighter colored than body South American group body dull to shiny tan or brown; smooth; margin of gold-like threads usually adhering to each other
C. ficifolia	hard, furrows shallow, smoothly rounded, widely expanded and flaring at base	usually black or dark brown, sometimes dingy-white; relatively broad; margin smooth and rounded

pepo is almost identical with a weedy, wild plant (*C. texana* Gray) found in Texas. Furthermore, the greatest number of pepo cultivars are found in Mexico and the United States with fewer kinds from Guatemala.

Pepo was the only species of *Cucurbita* grown over most of the United States in prehistoric times. Throughout the Southwest it appeared long before *C. moschata*. A large collection of cultivated plant material was recovered by Martin, Rinaldo and their associates from Tularosa Cave in western New Mexico (Martin and others 1952). Although this covers a period of at least 2200 years, there was very little increase in the diversity of pepo. Practically all of the material is from a heavy-peduncled, medium sized pumpkin, although some pepo harvested quite young, perhaps for use as a green vegetable, may represent another cultivar. To the north, in the region of the Glen Canyon of the Colorado River, remains of thick-shelled pepo specimens used for containers are frequently found (Fig. 7). They are especially abundant in sites which are dated later than A.D. 1100. Relatively few other kinds of pepo are found among the southwestern Indians even today, except for cultivars introduced in post conquest times. The lack of diversity of pepo in the Southwest is particularly striking when one considers the number of cultivars of pepo known from reports, and the abundance of prehistoric specimens from the Plains and the Northeast. As if to compensate for this relative lack of diversity in the pepos of the Southwest, two other cultivated

species entered the area in prehistoric times. Also, there was a far greater use of the wild species but their range extended eastward only to the southern parts of the plains and prairies, with the exception of the Okeechobee gourd.

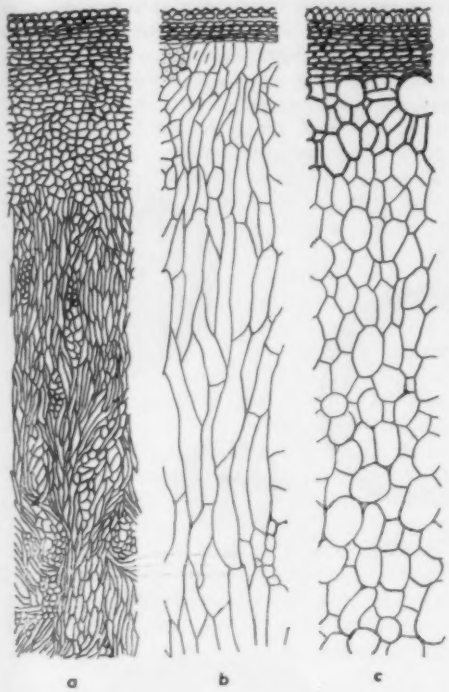

FIG. 5. Typical cross sections of rind or shell of *Crescentia*, *Lagenaria*, and *Cucurbita*, x 150. *a*, *Crescentia*, tree gourd; *b*, *Lagenaria*, bottle gourd; *c*, *Cucurbita*, pumpkin and squash.

Cucurbita moschata was the second cultivated species to enter the Southwest. It was grown in northern Peru by 3000 B.C. where it has been excavated, together with ficifolia in preceramic, premaize horizons (Whitaker and Bird 1949), and it appeared in the Ocampo Caves (Whitaker, Cutler, and MacNeish 1957) between 1400 and 400 B.C., the period of the Mesa de Guaje culture. This culture was characterized by pottery, figurines, and village life. The people grew corn, jack beans, common beans, and lima beans, and cotton. Although we have few collections on which to base a detailed study of the movements of cultivated plants, it is likely that cotton, lima beans, new kinds of corn, and moschata moved into the Southwest about A.D. 700 from Mexico. Our earliest most reliable and abundant records for moschata in the Southwest are from Kiet Siel (A.D. 1100–1284) and Montezuma Castle (A.D. 1100–1150) (Table 2). No specimens of moschata were found in the large quantities of cultivated plant material excavated at Tularosa Cave, although there was a decided change in the kinds of corn at this site in the San Francisco Phase (A.D. 700) when considerable amounts of cotton appear.

Moschata did not become a widespread or common cultivated plant in the Southwest but it may have spread to the Southeast, perhaps along the Gulf, in prehistoric times. The only pre-Columbian *Cucurbita* we have seen from the Southeast is pepo, but good archaeological collections of cultivated plants from that area

TABLE 4. RIND CHARACTERS OF *Crescentia*, *Lagenaria* AND CULTIVATED *Cucurbita*

	Crescentia	*Lagenaria*	Cultivated *Cucurbita*
Thickness	less than 1.5 mm.	1–16 mm.	1.5–10 mm., usually less than 4 mm.
Surface Appearance	usually smooth	usually smooth	often slightly furrowed, frequently smooth, especially in *C. mixta*.
Epidermis (surface cells)	absent	often absent	present
Cells beneath Epidermis	several layers of thick-walled stone cells	small layer of short stone cells followed by small, loose, thin-walled cells	several layers of hard, thick-walled stone cells
Inner Layer of Cells	thick-walled, small, woody cells	large, loosely organized long cells	large, isodiametric thin-walled cells, somewhat regularly arranged

are scarce. The Seminoles in Florida and many of the country people of Louisiana, Alabama, and Mississippi grow moschata cultivars, like Dickinson's Field Pumpkin, Cheese, Golden Cushaw, and Kentucky Field Pumpkin, but cultivars similar to these can be collected in Cuba and in coastal and southern Mexico. A recent unpublished study by Cutler and Blake of a series of corn collections from the Southeast shows that most of the corn grown in this area during prehistoric times was similar to the flint and flour corns of New England. Caribbean tropical flint types appeared in number at the time the Spaniards arrived. It is possible that the Spaniards also brought moschata from the Caribbean. In the Plains region the only moschata specimens have come from sites which have European material.

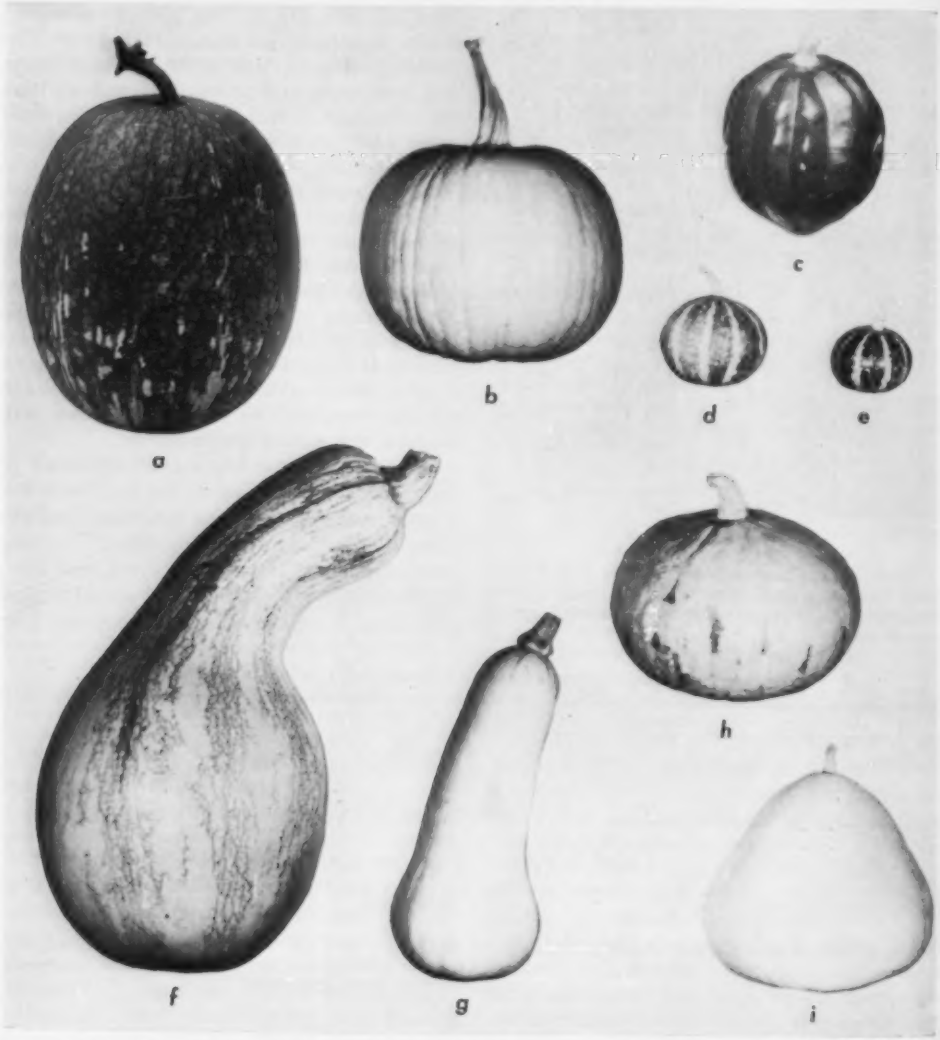

Fig. 6. Fruits of various cucurbits, x 1/5. *a, Cucurbita ficifolia,* chilicayote; *b, C. pepo* cultivar Field Pumpkin; *c, C. pepo* cv. Acorn Squash; *d, e, C. pepo* var. *ovifera*; *f, C. mixta* cv. Green Striped Cushaw; *g, C. moschata* cv. Butternut; *h, C. maxima* cv. Banquet; *i, Lagenaria siceraria.*

Cucurbita mixta Pang. is the youngest and least known of the cultivated annual cucurbits. Although described in 1930 from material collected by the Russian plant expeditions to the New World, a useful English description of mixta did not appear until 1950 (Whitaker and Bohn). Mixta specimens examined before 1950 were usually identified as *C. moschata*. Mixta apparently originated in Mexico where the largest number of kinds are found. The oldest material known is from the Palmillas culture of the Ocampo Caves, Tamaulipas, dated between A.D. 150 and 850. Thus, mixta appeared more than a thousand years later than moschata at the same site.

The oldest archaeological specimens of mixta from the Southwest may be from Fremont culture sites of the Glen Canyon of the Colorado River (Cutler MS on Glen Canyon materials excavated by Museum of Northern Arizona). Occasional specimens have been found there associated with cobs of a Mexican pyramidal dent corn practically identical with corn of central and western Mexico. Among the scanty vegetal remains of the Fremont culture sites at Yampa Canyon, there are a few pepo fragments but no mixta. It is likely that larger collections will have mixta, for the species appears occasionally in some Fremont culture and most Pueblo sites farther south, although never as frequently as pepo. Mixta is grown at Taos Pueblo today, under conditions not greatly different from those of the Fremont culture region. Is it possible that mixta and Mexican pyramidal corn were carried so rapidly to the Fremont culture area that there are few remains along the route? There are some suggestions in the dates of mixta material recovered that this species spread southeastward from the Fremont culture area. In spite of the large amount of anthropological work carried out in the upper Rio Grande River basin, we have little cultivated plant material which can be accurately dated so it has not been possible to establish precise dates for the introduction of mixta to this region. Several kinds of mixta seeds have been described (Cutler and Whitaker 1956). When more collections are available, the distribution of these seed types may help to show their dispersal pattern.

In the Glen Canyon region there are many collections of pepo and mixta from sites dated in the late 1100's and early 1200's. Compared with other areas in the Southwest there is an increase in the amount of hard-shelled pepo and the green-striped cushaw (mixta) used for containers. For the same period there appears to be a decrease in the amount of *Lagenaria*. This occurrence may reflect a climatic change, indicate an increasing emphasis on food plants, or show that pepo and mixta are easier to grow farther north. Pepo and mixta are grown in modern

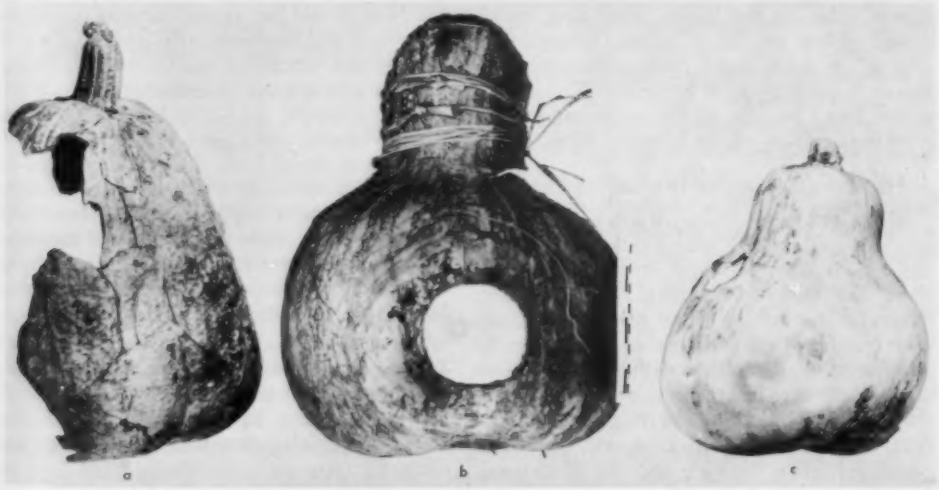

FIG. 7. Containers made of *Cucurbita* fruit from prehistoric sites in the Glen Canyon of the Colorado River, Utah. *a*, *Cucurbita pepo*, Site 42 Ka 172; *b*, *C. mixta*, Site 42 Sa 274; *c*, *C. mixta*, Site 42 Sa 619. Photos by Department of Anthropology, University of Utah.

pueblos, but there is very little moschata and *Lagenaria*. In several of the modern pueblos, the flesh is removed from mature fruits of mixta through a hole in the side of the upper part. The dried shell that results from this treatment is used as a sounding board for a wooden rasp as well as for a container. Whiting (1939: 93) reports that "the lower portion of the fruit may be cleaned out and the dried shell used by the children to carry parched corn." Both kinds of mixta containers, entire shells which have an opening in the side and bowls made from the lower portion of the shell, have been found in several sites in and about Glen Canyon (Fig. 7).

Cucurbita maxima was cultivated only in South America in prehistoric times. Ficifolia and moschata were the only species of *Cucurbita* to be excavated at Huaca Prieta in north coastal Peru but maxima has been found in several sites to the south (Carter 1945). The largest number of cultivars of this species are grown in the high valleys of southern Peru, Bolivia, and Chile. At lower altitudes in eastern Bolivia, Argentina, and Brazil a number of hybrids of maxima with weedy C. *andreana* are grown.

A squash similar to the well-known Hubbard probably was introduced in New England in the late 1700's and other maximas were grown in eastern states in the early 1800's (Tapley, Enzie, and Van Eseltine 1937). By the late 1800's similar kinds were grown by the Arikara and other Plains Indians and varieties of maxima are grown today by the Pueblo and other Indian groups. They are often called "white man's squash" or some other name suggesting their recent introduction. Whiting (1939), for example, lists a Hopi name for the turban squash, a maxima, which means Mormon squash.

History and Uses of the Bottle Gourd

There is only one species of this genus, *Lagenaria siceraria*, but it is grown in so many places and has so many sizes and shapes of fruit that there are numerous scientific and common names for this species. Obsolete scientific names most frequently encountered are: *Cucurbita lagenaria* L., *Cucurbita leucantha* Duch., *Lagenaria vulgaris* Ser. The terms calabash and gourd, while often applied to other fruits used for containers, usually refer to *Lagenaria*. A useful common name is "bottle gourd" for while many fruits are large and durable enough for rattles, snuff boxes, small musical instruments, only *Lagenaria* fruits are large enough and can be shaped to make the common water jugs used in so many parts of the world. The generic name has occasionally been used as a common name and is certainly the most precise one.

Lagenaria is easily distinguished from all species of *Cucurbita* by its white flowers, seed and leaf shape, and by the structure of the fruit rind (Fig. 5). It is a very distinctive species and clearly has no close affinities with any existing species of *Cucurbita*. Its relationship, however, to other genera in the family Cucurbitaceae is not well understood. There is no decisive evidence relative to the origin of this species, but it is probably indigenous to tropical Africa. This suggestion is based upon the greater variability of seeds and fruits of collections from Africa as compared to the few specimens from Asia and the collections from archaeological sites and living peoples in the Americas. Burkill (1935), an authority on the cultivated plants of Asia, has suggested that *Lagenaria* is indigenous to Africa and was domesticated in Asia. Schweinfurth (1884) has identified a rind fragment from an Egyptian tomb of the 5th Dynasty, dated about 3500–3300 B.C. The earliest record of *L. siceraria* in this hemisphere is from the Ocampo Caves, Tamaulipas, Mexico (Whitaker, Cutler, and MacNeish 1957). At this site, rind fragments were found in abundance in strata dated at 7000–5500 B.C.

Vavilov (1931) suggested that "the bottle gourd evidently has been carried to the coasts of the New World by oceanic currents or in some other way, and has been introduced into cultivation by the farmer of pre-Columbian times." Reasoning from some experiments in which they floated gourds in sea water for as long as one year, Whitaker and Carter (1954) suggest that the gourds could have floated across the Atlantic from Africa to South America with the seeds retaining a high degree of viability. If floating offers a reasonable method of transport, it is no longer necessary to invoke trans-Atlantic or trans-Pacific migration by man to explain the bi-hemispheric distribution of this species.

Lagenaria has been found in almost every archaeological site in the Americas wherever conditions were favorable for its cultivation, and vegetal materials were preserved. Rind fragments are usually abundant at most sites, and in many instances intact fruits have been recovered, along with a few seeds and peduncles. The scarcity of seeds of *Lagenaria* in archaeological deposits may be explained by their use

for food. Some of the Indian groups which grew *Lagenaria* recently are reported to have roasted and eaten the seeds just as they did the seeds of various species of *Cucurbita*. Apparently immature forms of *Lagenaria* were not eaten in the New World as they were in the Old World for there are few records of such use from living Indians and no specimens of the very large, thin-shelled forms of *Lagenaria* which were selected for food use. The use of young *Lagenaria* for food in Brazil (where it is called *abobra d'agua*, or water squash) appears to have come from Africa and is restricted to areas where the African *Momordica charantia*, the balsam pear, is common and many Negroes live.

Shells of the mature fruits were employed for all conceivable purposes around the household. For people lacking techniques of manufacturing cutlery and pottery, utensils made from *Lagenaria* shells were indispensable. Even in later cultures where pottery making was well established, *Lagenaria* continued to be used for water jugs, work baskets, and containers of various sorts. In some of the more advanced cultures, the people used the fruit shells for rattles in religious rituals and for face masks in ceremonial dances. *Lagenaria* was also used for dippers, spoons, pottery scrapers, cups, scoops, ladles, fish-net floats, medicine bottles, coca carriers, whistles, and many other things. Gourds patched with cords laced through drilled holes and treated with resin have been excavated at many sites. The care given these vessels is a good indicator of their value to the people using them.

Archaeology of the Cucurbits in the Americas

In Table 2 we have arranged the archaeological sites from which cucurbit material has been recovered according to their chronology. A number of sites frequently mentioned in the literature have been omitted for lack of definite identification of the cucurbit specimens, and because the material was not readily available for checking. It is evident from the data in Table 2 that pepo was present in the Woodlands from at least A.D. 1100 to the time of contact with the Europeans. The non-cultivated *Cucurbita foetidissima* and *Lagenaria siceraria* were also used. In the Plains area pepo is present earliest in the sites dated at about A.D. 1400. Moschata comes in after 1700; some non-cultivated species of *Cucurbita* was used, probably *C. foetidissima*. The modern Plains Indians had pepo, mixta, moschata, and maxima. In Southern Colorado, pepo is found as early as A.D. 174 at the Falls Creek site. *Lagenaria* is recorded from Step House at A.D. 610, and there are a few mixta specimens from Mesa Verde.

The rich collections from Arizona give a continuous and mostly overlapping record of cucurbits from A.D. 380 to 1346. Pepo and *Lagenaria* are found throughout the entire chronology. Moschata and mixta came into Arizona at about the same time (A.D. 900). There is abundant evidence that a non-cultivated species of *Cucurbita*, probably *C. foetidissima*, was extensively used.

The earliest record of cucurbits from the Southwest comes from the Cordova and Tularosa caves of New Mexico. Pepo and *Lagenaria* are recorded from these sites as early as 300 B.C. Mixta and moschata come in at A.D. 900 in the Pueblo II Rockshelters of Clark County, New Mexico. Mixta is recorded from several sites but this is the only occurrence of moschata. Seeds and rinds of *Cucurbita foetidissima* are also recorded from some sites in the area. The modern pueblos of San Ildefonso, Tesuque, and Taos had pepo, mixta, and maxima. In the Sunny Glen Cave of the Chisos Mountains of Texas, dated at A.D. 1300, pepo seeds were found.

The earliest recorded occurrence of the cultivated cucurbits is from Mexico. From the Ocampo Caves in Tamaulipas, pepo, *C. foetidissima*, and *Lagenaria* were recovered in strata dated at 7000 B.C. Moschata is recorded at 1850 B.C., with mixta coming in at A.D. 150. Pepo, mixta, and *Lagenaria* are found in Cave Valley, Chihuahua at about A.D. 900 and pepo in Durango at A.D. 1200.

In South America, ficifolia, moschata, and *Lagenaria* are reported from the huge midden at Huaca Prieta, Peru, in strata dated at about 3000 B.C. Maxima seeds were found at three locations in Peru, the oldest with a date of A.D. 600. A single peduncle of moschata has been identified from a Mayan ruin in Guatemala (Vestal 1938). The evidence suggests a date of about A.D. 900 for this material.

Other New World Cucurbits

Other cucurbits have been recovered from archaeological sites in the New World, while some occur as weeds in the tropics, or are wide-

ly cultivated. *Apodanthera undulata* Gray, the melon-loco, has soft fruits somewhat smaller than those of *Cucurbita foetidissima* and other wild *Cucurbita* species. It grows in weedy areas of the Southwest, and seeds have been found in several pre-Columbian sites. Although the seeds are reported to have been used for food by historic Indians, the possibility that they were introduced into sites by weeds growing nearby, or even over the site, after abandonment, or by rodents, should not be dismissed. From several sites we have seen seeds of *Apodanthera* which were clearly scratched by the paired teeth of rodents (Fig. 4).

Luffa operculata (L.) Cogn. is the only New World native of this genus. It is used widely in folk medicine (the seeds are a violent purgative) and has been collected from Mexico to Brazil and Bolivia, so it may be a true native. Margaret Towle, who has studied the major collections of plant materials from archaeological sites in Peru, reports in correspondence that she has not seen any in the Viru Valley material excavated by W. D. Strong or the Huaca Prieta material dug by J. B. Bird. It is unfortunate that the cultivated plants and related weeds of the New World have not been studied more thoroughly. The most complete reports are those of the several Russian expeditions directed by Vavilov and published in Russian from about 1927 to 1938.

Cyclanthera pedata Schrad. (called caiba, pepino, and a number of other names in tropical America) and several other species of this squirting cucumber-like plant are widely grown and undoubtedly native or cultivated since pre-Columbian times from Mexico to Chile. The fruit is so soft that it is unlikely any will be found in archaeological sites but the rough dark seeds would be readily recognized if found.

Sechium edule Sw. is the chayote of Mexico, and the xu-xu of Brazil. In its center of diversity in southern Mexico and the highlands of Guatemala there are numerous forms, from dark to light, fibrous to tender, small to large, and spiny to smooth. The plant is grown as a perennial and the large storage roots are frequently eaten. Since the bland fruit and the single large seed are soft, they have not been found in archaeological sites. They are, however, common in fields and markets in many parts of the Americas.

Sicania ordorifera Naud. has maroon or purplish, sweet fruits, with a nut-like odor. The fruit is eaten raw or made into candy. Although it may be found from Mexico to Bolivia and Brazil, and apparently is an indigenous, cultivated plant of the Americas, we have seen no archaeological specimens.

Old World Cucurbits often Grown in the New World in Post-European Times

Citrullis vulgaris Schrad., the watermelon or sandia, is widely grown in the New World and was introduced so soon after Europeans arrived that it has been considered a native by authors who knew little of its distribution and relationships. There is every reason to believe it is an Old World plant. There is no valid evidence to indicate it was present in the New World in pre-Columbian times. Watermelon seeds have never been found in a New World site unless other evidences of European contacts were present.

Muskmelons (*Cucumis melo* L.) are grown by many Indians in the Americas but they are introductions, like the cucumber (*Cucumis sativus* L.) from the Old World. For many years botanists speculated about the origin of the gherkin (*Cucumis anguria* L.), which is widely cultivated and found as a weed in Brazil and the Caribbean region. It is called maxixe in Brazil. Recent studies indicate that the gherkin was introduced from Africa, probably by the slave trade.

Another African cucurbit, the balsam pear (*Momordica charantia*), grows as a weed, often with *Cucumis anguria*, and usually in places where slaves formerly lived. In the case of the balsam pear, however, there never has been any doubt that the plant came from Africa for it is only used by Negroes and rarely grows far from their homes.

Acknowledgments. We are indebted to the officials of the John Simon Guggenheim Memorial Foundation, the National Science Foundation, and the Wenner-Gren Foundation for Anthropological Research for generous financial aid which made this and related studies possible. The following individuals have made our task and the results more significant by their helpful advice, comments, suggestions and criticism: Edgar Anderson, Emil Haury, Volney Jones, Paul Martin, and Waldo Wedel.

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THE PALEOLITHIC OF TRANS-BAIKAL

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Edited by Chester S. Chard*

Abstract

Paleolithic remains, mostly surface finds from blowouts, are known from 63 sites in the Trans-Baikal, one of the five large regional subdivisions of the Siberian Paleolithic. Most important recent discoveries are the stratified sites of Oshurkovo and Sannyi Mys and the Pleistocene faunal sequence on Tologoi Mountain. Characteristic stone tools are made from whole or split pebbles and from blades removed from prismatic cores. Bone artifacts, known only from Oshurkovo, include slotted points and knives and flat antler harpoons. The Trans-Baikal finds, all Upper Paleolithic in time, are tentatively arranged in five chronological stages. The earliest period is based on the lower levels at Sannyi Mys in which microblades, but no pebble tools, are found with woolly rhinoceros and mammoth. The next period is represented by large pebble tools and cores from Ust'-Kiakhta Locality 3. Typical Siberian pebble tools found with horse in the upper levels at Sannyi Mys are assigned to the third stage. The fourth is best known from Oshurkovo where all the common Siberian Paleolithic stone tools are found along with bone artifacts in deposits which contain abundant fish bones. A number of sites are assigned to the fifth stage, but it is best represented by the uppermost level at Oshurkovo where flakes, flaked pebbles, and small blade tools of regular outline replace the large blades and pebble cores of the earlier periods. This tentative sequence is strengthened by correlations with the Angara and Yenisei areas to the west and with Mongolia and North China to the east. The Trans-Baikal is seen as an area in which the prismatic core and blade tradition of Eurafrican origin and the split pebble-tool tradition of eastern Asia were in contact from the earliest known period.

THE PALEOLITHIC of Trans-Baikal represents one of five large regional groups of sites of the Siberian Paleolithic which correspond to the principal river systems of the area: the Ob, Yenisei, Angara, Lena and Selenga (Fig. 1).

Traces of the activity of Paleolithic man were first discovered on the territory of Trans-Baikal (Fig. 2) at the end of the 19th century in the basin of the Selenga River; near Kiakhta and farther downstream (northward) along the river from the Mongolian frontier to Lake Baikal. These comprised the collections of stone implements obtained in the 1880's and 1890's by A. P. Mostits, P. S. Mikhno, and IU. D. Tal'ko-Grintsevich in the vicinity of the city of Kiakhta, near Ust'-Kiakhta settlement, also in the valley of the Sava River, at the village of Zarubino, at Dureny on the Chikoi River, and in other places. Such collections continued to be made subsequently on the Selenga and in other districts of Trans-Baikal by P. S. Mikhno, G. F. Debets, and other investigators.

G. F. Debets was the first to specifically distinguish Paleolithic finds in Trans-Baikal and to classify them typologically; he also came to the conclusion that this "Selenga culture" preceded the so-called Daurian culture—the Neolithic of the steppe and wooded steppe of Trans-Baikal. Nevertheless, Debets decided not to date the Selenga culture to the Paleolithic period, considering it "premature to speak of this" (Debets 1930: 158–61). In 1928–29, collaborators of the archaeological expedition from the Academy of Sciences of the U.S.S.R., directed by G. P. Sosnovskii, were engaged in a study of the Stone Age in the Selenga valley and near Kiakhta. Sosnovskii, with P. S. Mikhno, organized a search for new Stone Age sites and was the first to state confidently that a local Paleolithic culture existed in Trans-Baikal. Sosnovskii located remains of this culture in the valley of the Selenga River from the Mongolian frontier down to Selenginsk, and also on the Chikoi and Sava rivers (tributaries of the Selenga). Here Sosnovskii recorded seven indubitable Paleolithic settlements in addition to three which he regarded as possibly to be considered among the oldest in the region. In eastern Trans-Baikal, Paleolithic finds were reported by Sosnovskii on the Onon and Ingoda rivers (information from S. I. Rudenko and A. K. Kuznetsov). Sosnovskii has described in detail in his writings the conditions under which Paleolithic implements occur in Trans-Baikal, the material from which they were made, and the technique of their manufacture. He noted the similarity of these artifacts to the stone implements characteristic of the Paleolithic of Siberia and of the Ordos region of North China (Sosnovskii 1932, 1934, 1939).

Nevertheless, V. I. Gromov, in summing up all that was known as of 1947–48 (when he completed and published his work on the geology and fauna of the Pleistocene period on the territory of the U.S.S.R.), wrote that "the Pal-

* The initial translation of the Russian manuscript was carried out by Loren R. Haury and Robert F. Nichols; Chard is responsible for the final version.

eolithic of the Selenga basin is still very little known, and no one has yet undertaken a specific study of the geological conditions under which it occurs" (Gromov 1948: 372).

After a ten-year interval, the study of the Paleolithic in Trans-Baikal was again taken up during 1947–58 by the Buriat-Mongol Archaeological Expedition from the Institute for the History of Material Culture, Academy of Sciences of the U.S.S.R., and the Institute of Culture of the Buriat-Mongol A.S.S.R., working under my direction. As a result, more than 30 new localities with remains of Paleolithic-type culture were discovered, some in districts where Paleolithic remains were, generally speaking, unknown previously: the Selenga valley from Selenginsk to the river's mouth, and also in the valleys of the Dzhida, Uda, Khilok and Chikoi rivers. New material was collected from these sites which significantly supplements our ideas about the stratigraphy of the Trans-Baikal Paleolithic, about the nature of this culture and its relationship to Paleolithic cultures of other areas.

Of especial importance was the discovery, near Oshurkovo village in the vicinity of the city of Ulan-Ude, of the first stratified site on the Selenga, which, moreover, yielded bone as well as stone artifacts and also faunal remains, including numerous fish bones (Figs. 3, 4). A second stratified site was discovered in 1958 at Sannyi Mys on the Uda River, where three Paleolithic levels and a Neolithic occupation have been identified (Figs. 5–7). Hitherto, Paleolithic cultural materials in Trans-Baikal had been encountered primarily on the surface of the soil, in blowouts, and lacking apparent stratigraphic association with faunal remains.

No less important for the study of the history of the Pleistocene fauna are the paleontological finds on Tologoi Mountain 14 km. above Ulan-Ude on the left bank of the Selenga. The faunal remains from Tologoi and Oshurkovo have been studied by specialists in zoology (Bibikova, Vereshchagin, Garutt, and IUr'ev 1953), and the geological conditions of the deposition of the animal bones and stone artifacts at Oshurkovo have been studied in situ by N. A. Florensov (Okladnikov and Florensov, n.d.).

In sum, we can now enumerate 63 places in Trans-Baikal where artifacts of Paleolithic appearance have been discovered, and which temporally precede the Neolithic sites: in the south, seven localities are known at present in the region of Kiakhta; two in the valley of the Sava River; 22 along the Selenga from Naushki to Selenginsk; 22 below Selenginsk, in the northern part of the Selenga valley; two in the Uda River valley; six on the Chikoi; one on the Khilok; and one on the Dzhida.

In addition, finds of Paleolithic appearance (besides those known earlier from the collections of S. I. Rudenko at Durungui and A. K. Kuznetsov on the Onon and Ingoda rivers) have been recorded at the city of Chita (Titovskaia Sopka) and on the Shilka River (Shilkinskii Zavod, Kularskaia village). In the Mongolian People's Republic sites of similar character have been found along the road from Kiakhta to Ulan-Bator, in the region of Ulan-Bator on the Tola River, on the Orkhon River near Erdeni-Dzu monastery, and also in the Gobi in the Dalan-Dzadagada region and apparently at Khalkhin-Gole (on Mount Khereula).*

ANALYSIS OF THE FINDS

The material from these settlements consists overwhelmingly of surface finds from blowouts. It is sizeable, but monotonous. One could even jump to the conclusion that no cultural change had occurred here. We will describe first these general features of the Trans-Baikal Paleolithic finds, and then attempt to elucidate complexes of different periods, based on the few undestroyed settlements.

In the collections of the museums in Chita, Kiakhta, Ulan-Ude, Irkutsk, and Leningrad there are hundreds of stone artifacts from the Paleolithic settlements of Trans-Baikal. A characteristic feature of these artifacts is the material of which they are made. This is a dark, greenish-gray or completely black, dense siliceous rock. In the Neolithic of Trans-Baikal, on the other hand, along with this rock (which was used primarily for making big tools), they used chalcedony, various jasper-like rocks, and flint for the manufacture of small objects (for example, side blades, arrow points), including the green-colored flint typical of Trans-Baikal. In the neighboring Angara valley, the chief materials for manufacturing Paleolithic tools were yellow argillite, white quartzite or gray striped flint from limestones (chalks) of Cambrian age.

* A section, "Description of the Paleolithic Sites," omitted here, is to be published with supplementary illustrations in *Asian Perspectives*, Vol. 4, No. 1 — EDITOR.

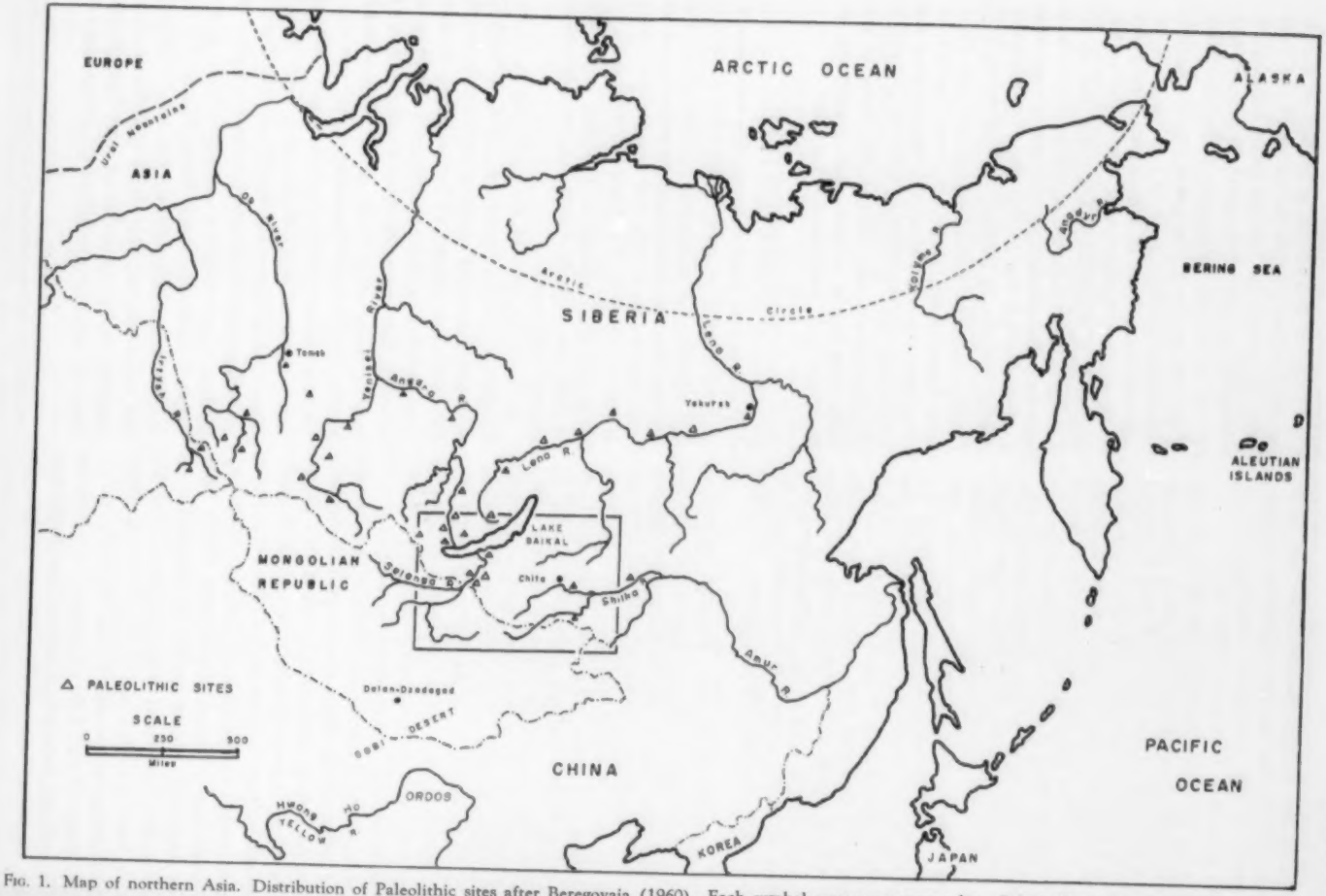

FIG. 1. Map of northern Asia. Distribution of Paleolithic sites after Beregovaia (1960). Each symbol represents areas where Paleolithic sites are located rather than individual sites. The area in the box is shown in greater detail in Figure 2.

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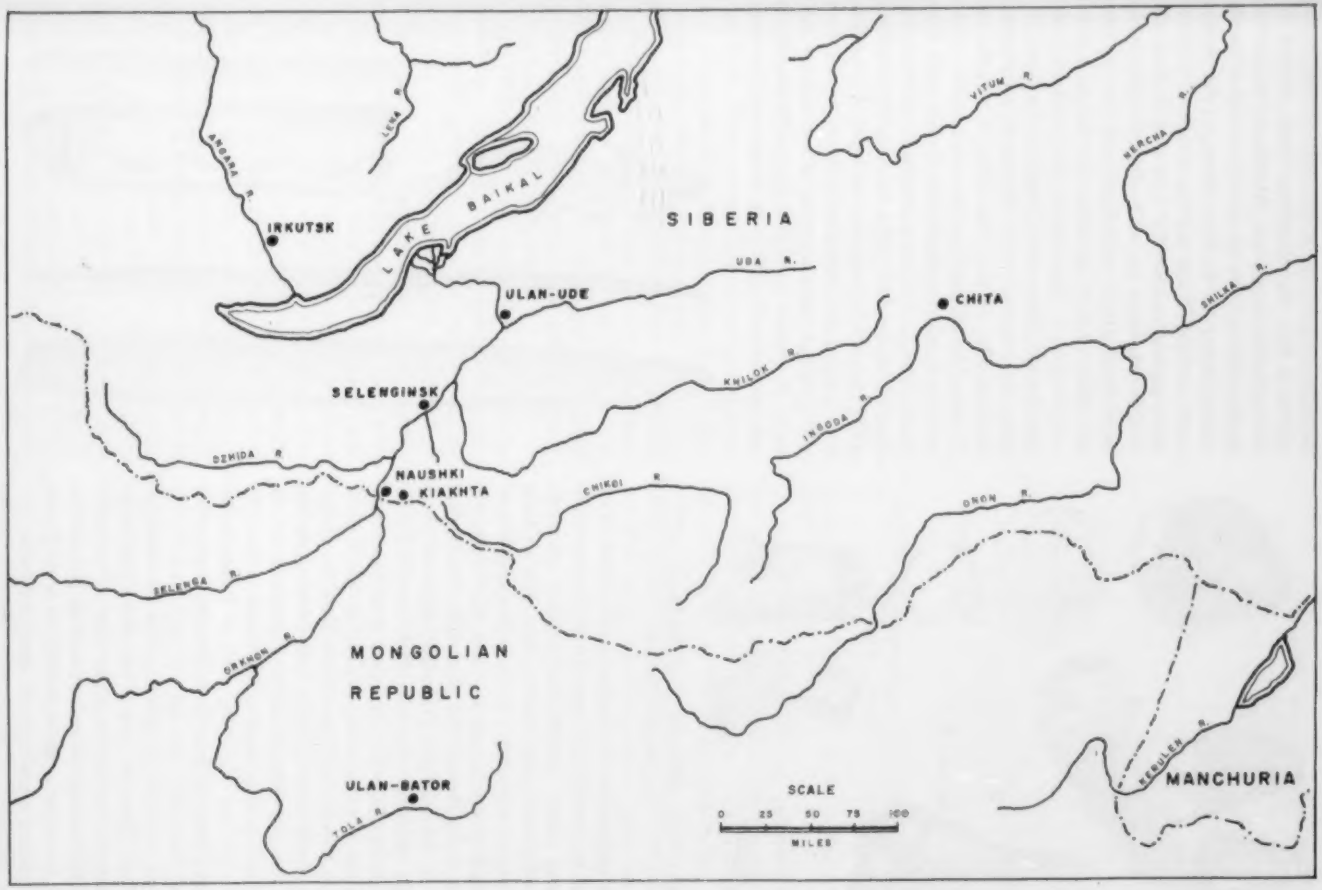

Fig. 2. Map of Trans-Baikal. Detail map of boxed area in Figure 1.

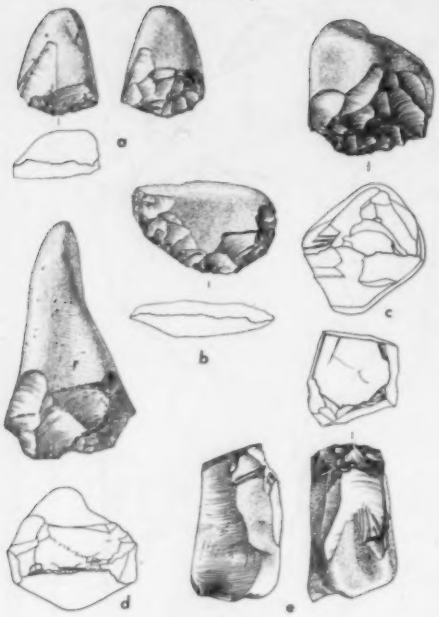

Fig. 3. Stone artifacts from the Oshurkovo site. Length of *d*, 16.5 cm.

The difference in the material of the stone tools is so marked and specific that even in the localities closest to the Angara—for example, in the Fofanovo area and at Km. 176 on Lake Baikal itself—one finds nothing but artifacts of this black stone. In just the same way when one crosses Lake Baikal and descends the Angara River to Irkutsk, one finds that material of an entirely different color was used to make Paleolithic tools; the collection of stone artifacts will be yellow, gray or white, but never black.

From this we may conclude that the Paleolithic inhabitants of Trans-Baikal evidently did not have any sort of definite, permanent ties with those of the Angara valley—in contrast to the succeeding Neolithic period. Lake Baikal divided them at that time like an impassable natural frontier.

Along with this, however, there are elements of culture that the two groups shared in common, exemplified in the uniformity of the methods of fashioning stone tools and in their forms. These attest the original kinship of both groups of the oldest population of eastern Siberia.

The working of stone was carried out by means of stone flakers and pressure flakers in the form of pebbles, on the ends of which have survived the characteristic scars created by blows against hard stone. Also found are pebble-anvils, the function of which is attested by the characteristic marks from blows on the smooth outer surface of the pebble, which often show small concentrations in the form of shallow pits.

Whole pebbles served as the raw material for tools. From them were fashioned the big tools and the cores from which blades and flakes were removed. The cores are both prismatic and disc-shaped. The former are the usual type; the latter are rarely found. Moreover, an essential characteristic of the Paleolithic of Siberia (including Trans-Baikal) is the combination of the technique of manufacturing stone tools from blades removed from a prismatic core (typical for the Upper Paleolithic of the West) with a different technique—the method of manufacturing them not from blades but from whole or split pebbles. Characteristic also is the combination of objects typically Upper Paleolithic in appearance and technique of manufacture with

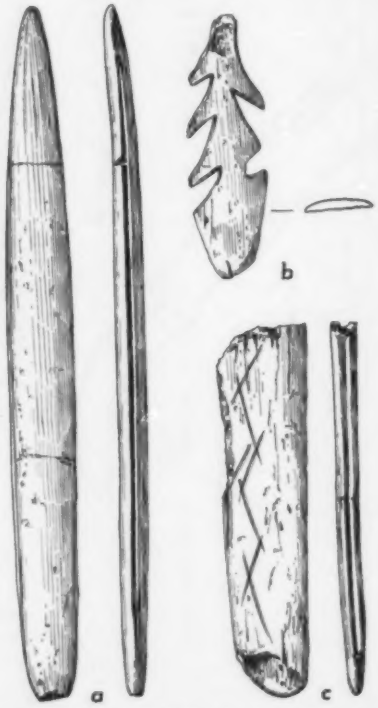

Fig. 4. Bone artifacts from the Oshurkovo site. Length of *a*, 18 cm.

other objects of archaic type reminiscent of Mousterian. In this category first of all (after the disc-shaped cores) are the big *skreblo*-like* implements known by the dozen from this area. In outline they approximate an oval, while their working edge is convex and located on one of the long edges, with the opposite long edge serving as a handle. One or both of the wide surfaces of the *skreblo* are formed by broad leveling facets; the working edge is often finished by finer, steeper retouch.

A second archaic element are the points, which are also reminiscent of Mousterian in outline; sometimes they are even made from flake-blades which are very similar to Mousterian: both long, narrow Levallois types and also the wide genuine Mousterian, massive, with shortened proportions. Like the Mousterian triangular points, they are worked by retouch along the very edge, and sometimes their surface is also formed by broad transverse flaking. Also similar are other points of perforator type, sometimes with a distinct handle and a narrow massive point. Points resembling Mousterian in form are comparatively rare beyond Lake Baikal; they occur more often to the west—on the Yenisei and in the Altai. Possibly this indicates an origin in the Mousterian culture of Central Asia. Such a conclusion is confirmed by the finds in the Ust'-Kansk cave in the Altai where, together with points of similar type, were bones of spiral-horned antelope (*Spirocerus*).

Associated with such archaic artifacts in the same site are also typically prismatic cores. Among the prismatic cores are often found big wide forms with regular, parallel, longitudinal wide facets. But there are also small narrow ones. Prior to use, one side of the cores of prismatic type (or all sides) are prepared and smoothed by flat transverse flaking. The cleavage plane of the stone served as the striking platform. Sometimes these platforms were smoothed by retouch. Cores which have been worked down to the limit often have a conical form or the appearance of narrow multi-faceted prisms or cylinders. A special variant is represented by the specific "core-scrapers." On one massive edge of these cores there are facets of longitudinal flaking, and the opposite edge is convex. It is sharpened by retouch to form a working edge. A second variant of the core-scraper differs in that there is a grooved straight or even concave working edge on the end opposite the striking platform.

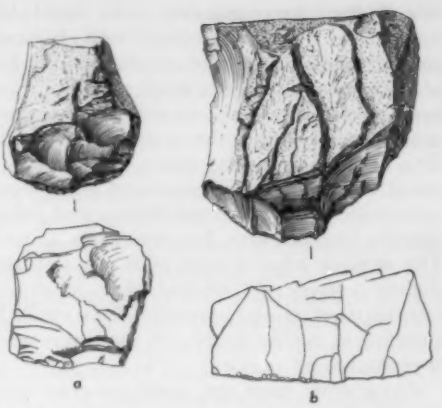

FIG. 5. Crude stone artifacts from surface collections at Sannyi Mys. Length of *b*, 13.2 cm.

Large blades removed from prismatic cores are most often wide with two facets on the back, that is, triangular in section; more rarely they have three facets. Micro-blades, on the other hand, are narrow, often with three parallel facets on the back. Many micro-blades have retouched edges—working edges. These were insert blades for wooden or bone slotted tools. Knives were fashioned from the large blades; these have the characteristic rather steep retouch along one or both edges. The wide massive blades, usually cut transversely, were used to make end scrapers, sometimes with their long edges also retouched. Micro-scrapers were also fabricated from flakes. Usually these are wide short scrapers with a convex working edge on one end. Often there occur scrapers made from flakes of elongated proportions, widened toward the working edge and narrowed toward the base —"tongue-shaped." There are also double-ended scrapers. Occasionally regular disc-shaped scrapers of miniature size are encountered.

A few massive dart points or knife blades of leaf-shaped form are known. These are lenticular in cross section. Both surfaces are carefully smoothed down by retouch. Beyond Lake Baikal these points are comparatively narrow and long, whereas at Verkholenskaia Gora and Ushkanka near Irkutsk, wide flat points were found.

Finally, we come to the stone artifact types which are rare in the Upper Paleolithic of the West. In this category are first of all the big

* A *skreblo* is best defined as a "large scraper." — EDITOR.

tools in the form of massive, heavy *skreblo*-like implements. They are produced by a characteristic method. A pebble of suitable form is first of all split in half with a single powerful transverse blow. Then one of its ends is left without any sort of working so that it serves as a handle. The opposite end—the plane of cleavage—is pared down with a succession of wide, steep, sometimes almost vertical flakes, and subsequently finished with fine secondary retouch. The working edge of such tools was as a rule slightly convex or straight, but sometimes (though very rarely) concave. They could be classified as pebble *skreblo*, or more accurately as spokeshaves.

Along with them are noted peculiar tools, also of whole pebbles, but more often of adz rather than spokeshave type. The first variant of this category are adzes with straight or slightly concave grooved cutting edge, and sometimes double-edged, that is, on both ends of the pebble. The second variant of these adzes are core-like artifacts, one wide surface of which is formed by wide longitudinal facets left from the removal of wide blades. The other side preserves the original surface or is flaked down. Their working edge is tranverse and retouched. A third variant are core-type tools with a wedge-like cutting edge. This edge is formed by longitudinal facets which are directed, however, towards the facets of the handle and which have on the end a characteristic step facet of burin type. These latter objects are similar to the core-like tools of the West, already known in the Aurignacian. But they differ in the presence of an untouched original surface on the end opposite the working edge. This end represents the handle, similar to what we see on chopping tools of the Lower Paleolithic of Europe, Asia, and Africa.

All these big objects can be identified as tools designed for working wood. The *skreblo* spokeshave type was most likely used for cutting and scraping wood, carving and smoothing down shafts of spears and similar artifacts. The remaining forms of large stone tools more probably served as adzes.

Bone artifacts (Fig. 4) are known from the Oshurkovo site, where three slotted tools were found. Two of them are flat bone blades with narrow shallow grooves along both edges for the insertion of stone blades. In the lower flattened part of the bone blade streaks are visible which evidently facilitated firmer hafting of the blade in the shaft. Judging by this feature, such blades could most likely be used as spear points. A third such object is a flat knife blade on which there is a groove only on one side. Thus in Oshurkovo were discovered both of the types of slotted bone blades which subsequently became typical for the Siberian Neolithic: spear points with two cutting edges and single-edged knives. Also at the same site were found small objects of bone and, of especial interest, a harpoon. The latter was carved from deer antler. It is flat, of "Azilian" type, with notches for lashing. In form and technique of manufacture it is identical with the harpoons from Verkholenskaia Gora. Here also there are single crude points of bone. In Oshurkovo was found a polished pendant of yellowish steatite, almond-shaped in form, with streaks on both sides and a serrated lower edge. This is the sole example of Paleolithic art from Trans-Baikal.

From a chronological viewpoint the Paleolithic on the Yenisei is divided into three groups on the basis of geological conditions. In the Angara valley, two groups are well marked: (1) the oldest group of the type of the Irkutsk Military Hospital (Solutrean?) and Mal'ta and Buret' (Early Magdalenian); (2) late sites, to

Fig. 6. Stone artifacts from Sannyi Mys. *a*, from first horizon; *b–h*, from second horizon. Length of *b*, 9.3 cm.

which are assigned all the remaining settlements.

In Trans-Baikal the following discoveries have recently been made on Mt. Tologoi near Ulan-Ude: (1) finds of Hipparion fauna; (2) a Middle Pleistocene faunal complex (*Spirocerus, Megaceros*, hyena, mammoth, reindeer, horse, ostrich). Traces of man contemporary with this faunal complex of the Riss and Riss-Würm epochs have not yet been found in Trans-Baikal. We have only a hint in the form of a skull of *Spirocerus* found on the Selenga with the horn core cut off by a flint tool. All indubitable remains of Paleolithic culture are associated with later, Upper Pleistocene deposits. They can be arranged in five chronological stages (Table 1).

1. The earliest such site is Sannyi Mys, the remains of a Paleolithic settlement at Tapkhar Mountain on the Uda River—more specifically, the two lower levels in which occurred bones of woolly rhinoceros and mammoth. On the basis of the presence of rhinoceros and mammoth, we must link them temporally with Buret' and Mal'ta. (At Afontova Gora on the Yenisei rhinoceros is already absent although the mammoth is still in existence.) An important fact in connection with this is that in both lower levels at Sannyi Mys there are no large *skreblo*. On the other hand, there are micro-blades here which have been struck from cores of prismatic or similar forms. An analogous technique is also known in Buret' and Mal'ta.

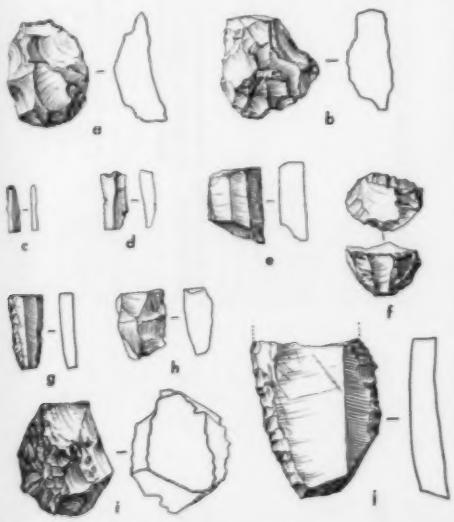

FIG. 7. Stone artifacts from Sannyi Mys. *a, b*, from third horizon; *c–j*, from fourth horizon. Length of *j*, 6.5 cm.

2. The finds at Ust'-Kiakhta Locality 3, where a massive disc-shaped *skreblo* and large oval *skreblo* were found, must represent the next stage. These objects are analogous to those found in the lower level at Afontova Gora. In late settlements on the Yenisei and Angara, such artifacts are absent.

3. At Sannyi Mys, above the early levels with rhinoceros and mammoth, lies a horizon with horse remains and with stone artifacts of typically Siberian forms (semi-lunar and oval *skreblos*). This probably represents the third stage in the Paleolithic of Trans-Baikal. The presence of wild horse indicates a dry steppe climate.

4. The succeeding, fourth stage is best represented by the finds at Oshurkovo. The fauna of the Oshurkovo settlement (for example, wild boar, *Cervus elaphus*) attests the reduction of open country and the expansion of the forest on the lower Selenga in comparison with earlier times. The culture of the inhabitants of the site remained as before despite the changes in environment. Here occur all the objects characteristic of the Siberian Paleolithic, including pebble *skreblo* manufactured from pebbles split crosswise. Of importance is the appearance of harpoons of the type found at Verkholenskaia Gora, and also the abundance of fish bones, with which the refuse accumulations are filled. Fishing had become an important occupation along with hunting, and a source of subsistence.

5. In addition to the three main cultural levels, one more was identified during subsequent excavations at Oshurkovo—the uppermost cultural horizon. The artifacts belonging to this horizon are represented by flakes, flaked pebbles, and lamelles of regular outline. These objects lay in the uppermost part of the loess-like sand-clay soil, directly under the sod layer. Certain other ancient settlements can also be assigned to this same time: for example, that at 2.5 to 3 km. above Oshurkovo village on the same side of the Selenga, also Ust'-Kiakhta (Localities 1 and 2), Khereksurin-uri, "Ivashka," and Diurben. Here also belongs the settlement on the Ivolga River, where numerous stone artifacts and fragments of animal bone have been collected. We are possibly dealing already with the Mesolithic or early Neolithic. Judging by the finds on the wind-eroded settlements at Ust'-Kiakhta (Localities 1 and 2), the ancient forms

TABLE 1. PLEISTOCENE OF TRANS-BAIKAL COMPARED WITH THAT OF NORTH CHINA

	North China			Trans-Baikal			Angara Valley and Yenisei
Geological Periods	*Deposits*	*Archaeological Remains*	*Fauna*	*Localities and Geological Context*	*Fauna*	*Remains of Man's Activity*	*Sites*
Holocene	Upper Black Earth	Late Neolithic and Bronze Age	Modern	Humus soil horizon at Oshurkovo	Modern	Neolithic and Bronze Age	Neolithic and Bronze Age
	Lower Black Earth	Finds at Harbin and Dalai-Nor	Modern	Upper part of loess-like deposits, 6–8 m. terrace at Oshurkovo	Modern		"Khina stage" on Angara
		"Dune Dwellers" of the Gobi				Upper level at Oshurkovo	
Late Pleistocene		Upper Cave at Choukoutien	*Cervus elaphus*	Deposits of 6–8 m. terrace at Oshurkovo (loess-like sand-clay)	*Cervus elaphus*, bison, moose, reindeer, wild boar, hare Mammoth disappears	Pebble spokeshaves and *skreblo*, crude prismatic cores, core-scrapers, etc. from lower levels at Oshurkovo; slotted tools, flat harpoons	Verkholenskaia Gora near Irkutsk
		Workshops along lUlinkhe River	*Elephas namadicus*, mammoth, bison, woolly rhinoceros, *Euryceros*	Ust'-Kiakhta Locality 3, Finds at Km. 125 on Ulan-Bator-Kiakhta Road	Mammoth fauna of Trans-Baikal	Large *skreblo*, disc-shaped cores from Ust'-Kiakhta Locality 3	Afontova Gora III, Pereselencheskii Point at Irkutsk
				Sannyi Mys (lower level)		Micro-scrapers, ostrich eggshell ornaments, bone point from Km. 125	Mal'ta, Buret', Military Hospital

Middle Pleistocene	Lower Yellow Earth	Sjara-Osso-Gol Shuitunkou Finds in the loess of Shansi, Shensi, Kansu	*Hyaena crocuta*, woolly rhinoceros, ostrich, *Spirocerus*, water buffalo, *Elephas namadicus*, mammoth, Dzhigetai, bison, Alces, maral, *Hyaena ultima*	Upper parts of deposits of 45 m. terrace on Tologoi (Riss-Würm Interglacial)	Fauna of upper level at Tologoi: mammoth, woolly rhinoceros, hyena, wolverine, horse, bison, *Megaceros*, reindeer, *Spirocerus*, ostrich	Skull of *Spirocerus* from Kiakhta with marks of a stone tool
Early Middle Pleistocene		Workshop on surface of basal gravels at Ubao. Quartzite artifacts in basal gravel of loess (Shansi, Shensi, Kansu) Locality 15, Choukoutien				
Early Pleistocene	Red loams and clays	Finds at Tingtsun (Fen River) Locality 1, Choukoutien Locality 13, Choukoutien	North: *Hyaena sinensis*, *Spirocerus*, water buffalo, *Machairodus* (small), *Trogontherium*, *Siphneus* (Giant) South: Indian rhinoceros, *Elephas namadicus*, gibbon, *Bubalus*, Gigantopithecus, Giant sloth			
Late Pliocene	Villafranchian beds (Middle Red clay)		*Elephas namadicus*, *Elephas planifrons*, *Elephas meridionalis*, *Siphneus tingi*, *Equus sanmeniensis*, *Paracamelus*, *Cervus boulei*, etc.	Lower part of deposit of 45 m. terrace at Tologoi	Fauna of lower level at Tologoi	
Early Pliocene	Lower Red clays		Hipparion fauna, Gazelle, Antelope, Ostrich, *Machairodus*	Pliocene deposits with Hipparion fauna on the Chikoi River	Hipparion fauna of Trans-Baikal	

of stone tools disappear now—including the big oval *skreblo* of "Siberian type," the core-like spokeshaves and the pebble chopping tools. Instead of big *skreblo*, micro-scrapers are now widespread—of regular forms, often end scrapers or disc-shaped types—similar to the Neolithic Daurian culture. The previous big cores and blades disappear; graceful prismatic cores are widely predominant, with their corresponding thin, narrow, symmetrical blades, with strictly parallel long facets. In surface collections are found peculiar tanged points on wide lamelles, having a lateral notch at the base. Only the edges, lateral notch, and tip of the point are retouched on these. Such retouch is on opposing sides, that is, the tip of the point is retouched on the under side, but the lateral notch is retouched on the back of the blade. These are the oldest arrowpoints. They are analogous to early Neolithic points from Khin'skaia Gorge on the Angara (Okladnikov 1950: 157–64; Debets 1930: 159, 168, Pl. 7, 7). G. F. Debets counted five such artifacts from the Uda River valley, four from Barguzin, seven from the valley of the Onon and Ingoda rivers. Here also evidently belong the first ax-like or adz-like tools, already reminiscent of Neolithic forms, though they are only flaked and not polished. They were discovered in 1949 in Mongolia on settlements of Paleolithic appearance in the vicinity of Ulan-Bator and on the Orkhon River opposite Erdeni-Dzu Monastery.

This projected scheme of a succession of five chronological stages in the Stone Age of Trans-Baikal preceding the Neolithic is, of course, still very incomplete and is of a preliminary nature, but all the same it gives an idea about the paths and trends in the cultural evolution of the ancient population of this region. On the whole, the Paleolithic culture of Trans-Baikal was extremely stable over the entire extent of its protracted existence. Specific traditions were maintained over millennia.

The problem of the origin and cultural relationships of the Paleolithic population of Trans-Baikal is a complex one. We noted above the correspondences with the Paleolithic of the Angara area and the Yenisei. But we must take into consideration also the links with the East, that is, with Mongolia and North China (Table 1). The finds of Hipparion fauna in Trans-Baikal, which are associated with red-colored beds, tie in with analogous deposits in North China. The fauna of the upper bed at Tologoi corresponds to the Middle Pleistocene fauna of China, when Ordos Man lived there.

Especially important for establishing links between the Trans-Baikal Paleolithic and China are the finds in the lower levels at Sannyi Mys. They tie in first of all with my 1949 finds at Km. 125 along the road from Ulan-Bator to Kiakhta, where in an undisturbed cultural deposit were discovered micro-scrapers (including round ones) and fragments of ostrich-egg shell which had been worked by man. One of them had a drilled perforation. Here also we found bone dart points of spindle-shaped form.

The finds at Km. 125, in their turn, tie in with the famous settlement of Sjara-Osso-Gol in the Ordos, where there are only miniature artifacts, and also pendants of bone. It follows from this that the small size of the stone artifacts from Sjara-Osso-Gol is not the result of the small dimensions of the initial pebbles but was determined by a different factor—that is, by a definite cultural-ethnic tradition. It remains unclear as to whether or not we can see here a reflection of traditions which arose in the West, in the Mediterranean, or whether this culture arose in Asia by convergence—in China, Mongolia, and Trans-Baikal. But the fact is that it does exist here.

As regards the origin of the peculiar features of the later stages of the Trans-Baikal Paleolithic, where the most important place is occupied by artifacts made from split pebbles—*skreblo* and adzes—then these latter can be linked with the ancient eastern traditions. Back in the epoch of Sinanthropus there existed in North China a characteristic method of manufacturing stone tools from whole pebbles, one end of which was worked by a series of transverse flakes while the opposite edge remained untouched and served as a convenient handle. This method subsequently runs through the entire history of Paleolithic technology in China. In Siberia, tools of this kind are already found in Buret' and Mal'ta. They also exist later; at Oshurkovo the main body of large tools is of this sort. From this stem the chopper-adzes, including the core-like forms with the pebble surface on the handle.

In general, it is evident that Trans-Baikal was a territory where two great cultural worlds of the primitive era were in contact from early

times. The first of these worlds is characterized by the presence of prismatic cores and corresponding blades, which are the basis of the technique of working stone. This represents the Eurafrican path of development (Capsian in the Late Paleolithic). The second world is characterized by the use of split pebbles and corresponding pebble tools. This is the East Asiatic path of development of stone-working technique. The Paleolithic history of Trans-Baikal was consequently a history of the complicated interaction of groups of Paleolithic men who differed in their origin and culture.

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MINIATURE MUSHROOM STONES FROM GUATEMALA

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ABSTRACT

A cache of nine miniature mushroom stones and nine miniature metates with manos from the Verbena cemetery at Kaminaljuyú, Guatemala, date from the Verbena subphase of the Miraflores phase of the Preclassic, 1000–500 B.C. All of the mushroom stones are of Type B with a circular groove around the base of the cap. This type has been found in a Verbena tomb in Mound E–III–3 at the same site. The cache of nine miniatures demonstrates considerable antiquity for the "mushroom-stone cult," and suggests a possible association with the nine lords of the night and gods of the underworld, as well as the possible existence of a nine-day cycle and nocturnal count in Preclassic times. The association of the miniature mushroom stones with the miniature metates and manos greatly strengthens the possibility that at least in some areas in pre-Columbian Mesoamerica metates were used to grind the sacred hallucinatory mushrooms to prepare them for ceremonial consumption.

DURING the month of January, 1960, while conducting archaeological investigations in Guatemala, I had the privilege of studying the rich, private collection of Karl Heinz Nottebohm, of Guatemala City. Among the many newly-acquired archaeological specimens in his collection was a striking group of ten miniature mushroom stones and two miniature metates with manos (Fig. 1). According to Nottebohm, nine of the mushroom stones, along with nine miniature metates and manos, were taken as a unit from a prehistoric cache in the Verbena cemetery at the archaeological site of Kaminaljuyú, in the outskirts of Guatemala City. The tenth specimen, the tallest in the collection (height, 19 cm., effigy mushroom stone in center of Fig. 1), was also found in the area of the Verbena cemetery some distance from the previously-mentioned cache. Unfortunately, the exact location, within the Verbena cemetery, of the mound which yielded the cache containing the mushroom stones has not been disclosed by the finder.

Similar, but much larger, mushroom stones have been reported with relative frequency from Kaminaljuyú, as well as other areas in the Guatemalan Highlands and Southern Mexico (Kidder, Jennings, and Shook 1946: 104, 142, Figs. 58 *c*, 160 *a-h*; Shook and Kidder 1952: 112, Fig. 78 *f*; Lothrop 1933: 29, Fig. 11; Villacorta and Villacorta 1927: (123–25). My classification of mushroom stones (Borhegyi 1957) is presented in modified form in Figure 2 and Table 1.

These "enigmatic" objects ordinarily average from 28 to 38 cm. in height, although some of the presumably Late Classic (A.D. 600–900) mushroom stones, from the south coast area of Guatemala, are slightly smaller (22–26 cm.; Thompson 1948: 24, Fig. 19 *f*). The only miniature specimens, heretofore known, consisted of a fragmentary example in the Dieseldorff collection in the Guatemalan National Museum (No. 7567), representing a deer or rabbit (height of fragment, 7 cm.; Fig. 2 *14*), and one plain mushroom stone in my collection (height, 10.5 cm.). While the provenience of the former specimen is unknown (presumably the Department of Quiché, Guatemala), the plain example in my collection was discovered by one of my students in the Verbena cemetery area of Kaminaljuyú.

The nine miniature mushroom stones in the Nottebohm collection range in height from 14 cm. to 18 cm. Among them, there are four plain (including one tripod), three zoomorphic (one jaguar, two birds), and two anthropomorphic specimens. Although there are only two miniature metates with manos in Figure 1, the original cache contained nine. Apparently, there was one metate and mano for each miniature mushroom stone. Considering the reliability of both the owner and the finder, there is little doubt that the nine specimens, together with the metates and manos, were deposited in the cache in such a way as to constitute an offering.

All of the miniature mushroom stones in the Nottebohm collection have a circular groove around the base of the cap, which places them into my Type B (Fig. 2 *12–16*). Type B mushroom stones, without exception, are of Early and Late Preclassic date (1000 B.C.–A.D.200). Shook and Kidder (1952: 112, Fig. 78 *f*) found a large, tripod, jaguar-effigy mushroom stone (height, 37 cm.) with a similar circular groove around the base of the "mushroom" cap in Tomb I, Mound E–III–3, in the Verbena cemetery area. The contents of Tomb I in Mound E–III–3 were assigned to the Verbena subphase of the Miraflores phase (1000–500 B.C.). Shook and Kidder (1952: 112) state that "there can be no doubt that the making of these curious objects [mushroom stones] began at least as early as the Verbena subphase." There can also be little doubt

FIG. 1. Miniature mushroom stones, metates, and manos from Kaminaljuyú, Guatemala, in the Nottebohm collection. Except for the effigy mushroom stone in the center of the back row, all were found in a Late Preclassic cache (Verbena subphase of the Miraflores phase, 1000–500 B.C.). From left to right: *back row*, plain mushroom stone with grooved decoration, height 14 cm.; effigy mushroom stone, possibly a vulture, height 18 cm.; effigy mushroom stone representing an owl or Moan bird, height 15 cm.; effigy mushroom stone, an aged individual seated crosslegged, height 17.5 cm.; effigy mushroom stone of a seated individual with clenched fists, not associated with the cache, height 19 cm.; mushroom stone in form of a youthful individual seated crosslegged, height 16 cm.; effigy mushroom stone, possibly a jaguar, height 17 cm.; tripod mushroom stone, height 16 cm.; plain mushroom stone with vertical gouging, height 14 cm.; *front row*, miniature legless metate with mano, length of metate 10 cm., width 8 cm., length of mano 6 cm., diameter 2 cm.; plain mushroom stone with incised decoration, height 14 cm.; miniature metate with mano, dimensions same as other metate and mano.

that the nine miniature mushroom stones in the Nottebohm collection with their nine metates and manos, found in the cache in the Verbena cemetery area, are at least as early as 1000 B.C. The custom of circularly grooving the base of the mushroom-stone caps was discontinued after the Early Preclassic period. The Late Preclassic (500 B.C.–A.D. 200) and Classic (A.D. 200–900) period carved effigy, plain, and tripod mushroom stones have only plain caps (Fig. 2).

It is interesting to note that the same Tomb I of Mound E–III–3 also contained four small mortars and pestles of gray stone, two of them in the shape of toads (Shook and Kidder 1952, Fig. 78 *a-c*, *e*). Shook and Kidder (1952: 111) observe that "neither the grinding depressions nor the ends of the pestles show appreciable wear and although it seems probable that these mortars were designed for pulverizing paints, none retains any trace of pigment." Furthermore, "the two round mortars and the two small ones with amphibian heads were stacked together in a great pile of offerings along the south side of the tomb and all five pestles lay with them." There seems little doubt that the jaguar-effigy mushroom stones and the stone mortars were placed in the tomb as burial offerings. It should also be noted that three other fragments of the heads of mushroom stones were found in the fill of Mound E–III–3.

It is significant that the nine miniature mushroom stones and the nine metates and manos in the Nottebohm collection were found as a unit in a cache. Ceremonial offerings, such as jade carvings, stingray spines, eccentric flints and incised obsidian blades in groups of nine have frequently been encountered in the Maya area. Most, however, were found in association with burials or as sub-stela caches or vault caches in sites in the Lowland Maya area (such as, Uaxactún, Tikal, Guatemala, and Baking Pot, Pomona, British Honduras; summary in Kidder 1947: 21–4, 59, Figs. 69–71). These caches date, not from the Preclassic, but from the Early and Late Classic (mostly Tepeu 2, A.D. 700–800) periods. To my knowledge, no Preclassic Highland Maya cache offerings in the number nine have previously been reported.

Table 1. Typology, Chronology, and Distribution of Mushroom Stones*
(Modified from Borhegyi 1957)

Types	*Chronology*	*Distribution*
Type E		
Miscellaneous and possibly related stone (41–45) and pottery (46–48) objects	Chronological position uncertain	Central Guatemalan Highlands Uncertain locality (41–45) Western El Salvador Santa Elena (48) Eastern El Salvador Not illustrated (compare 46–48) Quelepa, San Rafael-Oriente, and Lolotique in Dept. San Miguel Santa Elena in Dept. Usulután Mexico Not illustrated Guanacaste, Chiapas (compare 48) El Bellote, Tabasco (compare 44, 46)
Type D		
Tripod mushroom stones with plain (39, 40) or carved (38) stems and with clubby (40) or sharp angled (38, 39) feet	Late Classic A.D. 600–900	Central Guatemalan Highlands Kaminaljuyú (38–40) Not illustrated Antigua (compare 38–40) Zacualpa (compare 39, 40) Eucaliptus, Agua Caliente, Amatitlán, Pompeya, San Martín Jilotepeque, Tecpan-Iximché (compare 38, 39) Mixco Viejo (compare 40) Pacific Coastal Plains of Guatemala Not illustrated (compare 39) El Baúl Los Diamantes El Carmen Western El Salvador Not illustrated (compare 39) Tazumal Finca la Montaña
Type C		
Effigy (17–31) or plain (32–37) mushroom stones with square (17, 18, 20–23, 25, 26, 28, 31, 35) or rounded (19, 24, 32–34, 36, 37) bases and without circularly-grooved caps	Late Preclassic 500 B.C.–A.D. 200 and probably Early Classic A.D. 200–600	Central Guatemalan Highlands Kaminaljuyú (17–20, 27–29) Cerro Alux, Mixco (31) Salcaja (25) Uncertain locality (21–24, 26, 30) Not illustrated Tecpan-Iximché (compare 18, 36) Amatitlán (compare 20) Pacific Coastal Plains of Guatemala Lago Ixpaco (36) Not illustrated Lago Ixpaco (compare 20) El Salto (compare 21) Guazacapán (compare 31) Retalhuleu (compare 28) Ayarza (compare 18) Mexico Ocosingo, Chiapas (32) Not illustrated La Grandeza, Chiapas Chiapa de Corzo, Chiapas (compare 32) Oaxaca (compare 32, 33, 36, 37) Tabasco (compare 32) Western El Salvador Tazumal (33) Las Victorias (35) Uncertain locality, probably Chalchuapa area (37) Bolivia, South America Inca-Uyu, Chucuito (34)

* Numbers in parentheses refer to objects illustrated in Figure 2.

TABLE 1. TYPOLOGY, CHRONOLOGY, AND DISTRIBUTION OF MUSHROOM STONES (continued)

Types	*Chronology*	*Distribution*
Type B		
Effigy mushroom stones with circularly-grooved caps and square (12–14) or tripod (15, 16) bases	Early and Late Preclassic 1000 B.C.–A.D. 200	Central Guatemalan Highlands Kaminaljuyú (12, 13, 15) Quiché (16) Uncertain locality (14)
Type A		
Anthropomorphic stone sculptures with plain (1–5, 7) or circularly-grooved (6) mushroom caps; plain (10, 11) and circularly-grooved (8, 9) stone mushroom caps	Chronological position uncertain	Central Guatemalan Highlands Kaminaljuyú (2–4, 8, 10) Salcaja (6) Chukumuk (9) Xikomuk (11) Uncertain locality (1, 5, 7)

What is the significance of the number nine in ceremonial cache offerings? According to Thompson (1950: 12):

> In the pantheon of the peoples of Mexico and of the Maya there was a group of nine deities, called in Yucatec Bolon-ti-Ku, "nine gods," who were the lords of nights, and gods of the underworld. They ruled in succession over the nights, in contrast to the 13 sky gods who apparently ruled the days in sequence.

The glyphs of the nine Maya lords of nights and gods of the underworld are known (Thompson 1950, Fig. 34), but not all of them can be properly identified. On the other hand, the names of the nine lords of the nights of the Aztec have been preserved for us by Serna (1892). With the corrected orthography of Thompson (1950: 208), they are:

1. Xiuhtecutli, God of fire, year or grass.
2. Itzli, God of flint.
3. Piltzintecutli, Lord of the youths or youthful lord.
4. Centeotl, God of maize, ears of corn, and bread.
5. Mictlantecutli, God of infernal regions.
6. Chalchihuitlicue, Lady with skirt of jade.
7. Tlazolteotl, Goddess of love.
8. Tepeyollotl, Heart of the mountains (jaguar).
9. Quiauitecutli (Tlaloc), Lord of the rain.

The glyphs of the Maya Lords of the nights do not correspond closely to the Mexican gods. According to Thompson (1950: 208–10, Fig. 34), the Maya series presumably starts with glyph G_1 and ends with G_9. They may be summarized with reference to their various representational contents as follows:

G_1 Head of God C, water symbol (circlets, Kan cross), monkey features, fish symbol.

G_2 Water symbols (small circles), head variant that of a youthful deity, jade and vegetable symbols, possibly a rain deity.

G_3 Moan bird, bird of the rainclouds, a pluvial deity.

G_4 Roman nose deity, possibly a maize deity.

G_5 Earth monster, Mam (the god of the interior of the earth), the conch man.

G_6 A youngish deity.

G_7 Jaguar paw, puma, a deity of the interior of the earth (a counterpart of the Aztec jaguar god, Tepeyollotl).

G_8 Conch shell (symbol of the surface and the interior of the earth), Mam.

G_9 The night sun, aged sun god.

Admittedly, any attempt at identification of mushroom stones, with the nine gods of the Aztec or Maya pantheon, is on very shaky ground. Nevertheless, many if not all of the mushroom stones, both miniature and large, may possibly represent Highland Maya versions of the nine lords of the nights. They are listed here with tentative identifications in parentheses. Numbers refer to Figure 2.

1. Aged individual, seated crosslegged or squatting (aged sun god, night sun, Xiuhtecutli, G_9 — 1, 2, 16, 17).
2. Youth, seated crosslegged or squatting (Piltzintecutli, youthful lord, G_6 — 3–6, 18, 19, 41, 42).
3. Birds, such as vultures, owls, Moan birds (G_3—28–30).
4. Monkeys, may be the spider monkey (G_1, God C—21).
5. Jaguars or pumas (Tepeyollotl, G_7 — 12, 15, 20, 22, 43).
6. Rabits or deer (fertility, moon — 13, 14, 23, 24).
7. Pisotes, coati-mundi, *chic* — association with buffoonery, women, sex, and love (25–27, 44).
8. Toads or frogs, rain association (G_2 — 31, 45).

Of the nine miniature effigy mushroom stones in the Nottebohm collection, the second from the left in Figure 1 represents a bird (possibly a Moan bird or G_3); the fourth from the left represents an aged individual, seated crosslegged (possibly the night sun or G_9); the third from the right represents a jaguar (possibly Tepeyollotl or G_7); and the fourth from the right represents a youth, seated crosslegged (possibly youthful lord, G_6 or G_2). No explanation can be

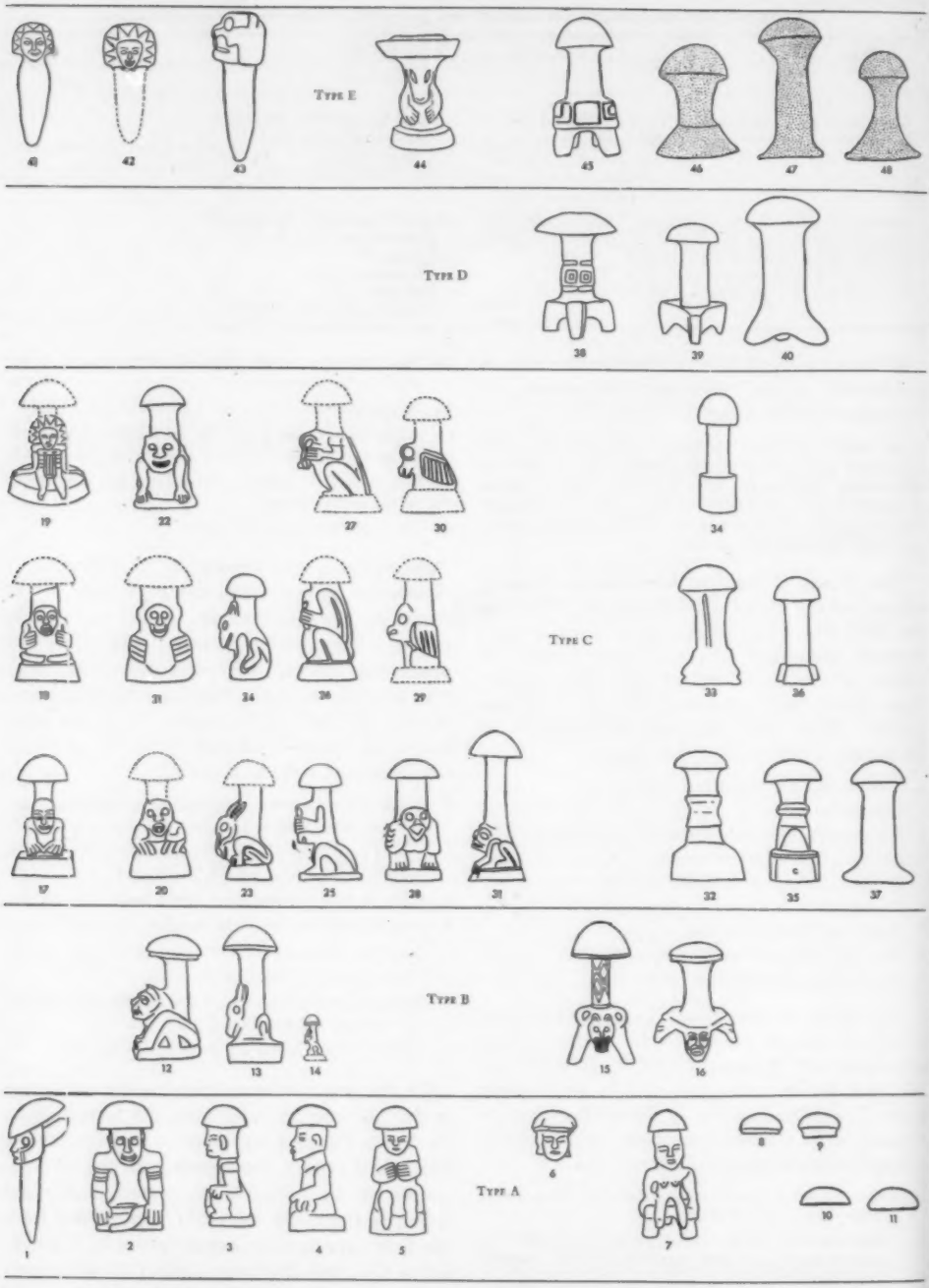

Fig. 2. Typology of mushroom stones. See Table 1 for explanation. Modified from Borhegyi 1957.

given for the additional bird effigy, or for the three plain and one tripod mushroom stones.

Whether or not the tentative identification of four of the miniature mushroom stones with the gods of the night is correct, the presence of nine offerings in a ceremonial cache from the Preclassic period indicates that the Maya belief in the nine gods of the underworld—and possibly in the 13 gods of the sky—may have originated as early a 1000 B.C. This period also saw the beginning of mound-building activities and rich tombs in the Maya Highlands. This presupposes a highly organized and stratified, social structure. There has been some debate as to whether the social control necessary for the production of such large-scale public enterprises was externally motivated (in the form of a "police force"), or internally motivated (belief in the rewards of heaven and the punishments of hell). If the nine gods of the underworld did, indeed, represent the idea of a "hell," as reported by the early Spanish chroniclers, then the presence of the nine mushroom stones in a Preclassic cache may indicate the existence of this concept among the Highland Maya, at a very early date. It would also explain why pilgrims, flocking to the Maya ceremonial centers, were willing and eager to enlist in the extensive building activities.

The purpose of the nine miniature metates and manos is still in question. Like the four small mortars and pestles found in Tomb I of Mound E–III–3, none shows signs of wear or use. Their presence with the mushroom stones must, therefore, have been primarily ceremonial or symbolic. Could this suggest that regular-sized metates and manos were used in connection with the larger mushroom stones? Could they have been used to pulverize or crush actual dried or fresh "sacred" mushrooms (*teo-nanacatl*) to induce, when eaten, hallucinatory trances and dreams — dreams in which, according to 16th century Spanish chroniclers, jaguars, birds and snakes, as well as little gnome-like creatures (possibly gods of the underworld) were seen (Wasson and Wasson 1957: 223–4)? These and other questions still await an answer.

Pertinent to the mushroom stone and metate problem is the discovery by R. G. Wasson and Robert Ravicz in June and July, 1960, that the metate is still used in the mushroom rite among the Mixtec of Oaxaca. They found that the sacred mushrooms (*Psilocybe mexicana* Heim) are supposedly gathered by a virgin (usually female), that the virgin grinds them on a metate with a little water, and that the gray fluid heavy with sediment is then drunk by the person who wishes to consult the mushroom. This practice has not been reported elsewhere, but perhaps it survives in other areas not yet explored. If the ceremonial metates were a symbol of this practice, is it possible that the mortars and pestles reflected the crushing of the *ololiuqui* seeds, which were and are widely used as a substitute for mushrooms when the latter are not available?

An effigy mushroom stone in the Namuth Collection in New York (Fig. 3; also illustrated in Wasson and Wasson 1957, Vol. II, Pl. 44) represents an aged woman kneeling before a metate-like object. She is shown in the characteristic position employed by women to grind meal. The specimen is from the Guatemalan Highlands and belongs stylistically to the Preclassic period (Type B mushroom stones). It is quite possible that this mushroom stone depicts a Preclassic version of the very same mushroom-grinding ceremony observed by Wasson and Ravicz among the present day Mixtecs of Oaxaca.

When all questions of a theoretical nature are put aside, we can derive from the miniature mushroom stones in the Nottebohm collection the following new facts and inferences of interest to Highland Maya prehistory:

1. The existence of miniature mushroom stones (height of 10 to 19 cm.).
2. Their ceremonial association, in a group of nine, with miniature metates and manos.
3. The antiquity of the "mushroom-stone cult," as far back as the Verbena subphase of the Miraflores phase (1000–500 B.C.).
4. The possible association (or even representation) of the *Bolon-ti-Ku*, the nine gods of the night and the underworld.
5. The possible existence of the nine-day cycle and nocturnal count in Preclassic times.
6. The possibility of a more elaborate pantheon and counting system among the Preclassic Highland Maya than previously assumed.
7. The possibility that at least in some areas in pre-Columbian Mesoamerica, metates or mortars were used to grind the sacred mushrooms, or crush the *ololiuqui* seeds, before ceremonially drinking or eating them.

Acknowledgments. It is a pleasure to express my gratitude to the trustees of the Milwaukee Public Museum and to the American Philosophical Society, Philadelphia, under whose auspices the 1960 archaeological research in Guatemala was undertaken. Thanks are also extended to

Karl Heinz Nottebohm for the use of material from his collections, to A. V. Kidder who read the manuscript and supplied several useful comments, to R. G. Wasson and Robert Ravicz for their data on Mixtec mushroom rites, and to Leo Johnson, photographer of the Milwaukee Public Museum, and Hans Namuth, New York, for the photographs.

This paper is dedicated to the memory of Dr. Valentina Pavlovna Wasson who, unfortunately, did not live long enough to see the many important results deriving from the research she conducted in collaboration with her husband, R. Gordon Wasson.

Fig. 3. Large effigy mushroom stone representing an aged woman kneeling before a metate, from highland Guatemala, exact location unknown. This Late Preclassic (1000–500 B.C.) specimen is in the Hans Namuth collection, New York. Height 36 cm. Photograph by Hans Namuth.

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THE ZONED BICHROME PERIOD IN NORTHWESTERN COSTA RICA

MICHAEL D. COE AND CLAUDE F. BAUDEZ

ABSTRACT

In an attempt to establish an archaeological chronology for northwestern Costa Rica, excavations were carried out in 1959–60 in the coastal region and Tempisque River drainage of Guanacaste Province. Four periods have been defined: Zoned Bichrome, Early Polychrome, Middle Polychrome, and Late Polychrome. These are roughly equated in the Maya sequence with Late Formative, Early Classic through the beginning of Late Classic, the latter part of the Late Classic through the early Postclassic, and late Postclassic, respectively. The Zoned Bichrome period has been established on the basis of three geographically separate but coeval phases: Chombo on the Santa Elena Peninsula, Monte Fresco in the Tamarindo Bay zone, and Catalina on the middle Tempisque. All three phases are linked to each other through trade pottery; a radiocarbon date on Monte Fresco is within the first century of the Christian era. Outstanding characteristics of the period are bichrome zoning, dentate rocker-stamping, wavy black lines produced by a multiple brush, engraving, and incising. Considerable fishing and hunting was carried out, and intensive maize agriculture is inferred. These village materials indicate that lower Central America was participating in at least some of the trait diffusion which linked remote areas of Nuclear America in Formative times.

GUANACASTE PROVINCE, in northwestern Costa Rica near the Nicaraguan border, is perhaps the region of lower Central America best represented in museum collections but the least known archaeologically. Destructive and unchecked grave looting, a major source of income to the inhabitants of the Nicoya peninsula since the 19th century, has produced uncounted thousands of vessels, carved metates, jades, and other art objects, but very little in the way of a sound chronology or any understanding of the cultural evolution of the pre-Spanish inhabitants. Hartman's excavations in the cemetery of Las Huacas, near the town of Nicoya, were a pioneer attempt to introduce accurate observation and recording into Costa Rican archaeology, and his report on the graves he found there will be of great value in the near future as we learn more about the Early Polychrome period in which most of the grave goods can be placed (Hartman 1907). Lothrop's great compendium was an attempt to arrange in some sort of classification the immense number of ceramic pieces that had appeared in collections, but was of necessity an ordering without chronological depth. The work is, however, an invaluable source of comparative material (Lothrop 1926). Until recently, therefore, the general impression has remained that northwestern Costa Rica, the so-called "Nicoya" zone, was essentially without any great depth in time—without archaeological deposits older than two or three centuries prior to the Conquest — and largely lacking in stratified sites.

That this impression is totally erroneous is clear from the extensive surveys and excavations which we have carried out in this region. During 1959–60 Baudez, on behalf of the Musée de l'Homme, Paris, concentrated on the zone of the Middle Tempisque River. Concurrently, Coe covered extensive areas of coastal Guanacaste for the Institute of Andean Research, supported by a grant from the National Science Foundation. Sites are common everywhere, especially midden deposits, although cemeteries (usually looted, alas) are frequent in hilly country. While only in rare cases are the cultural deposits more than 2 m. thick, many a site proved to be distinctly stratified culturally—that is, to have more than one phase represented. On the basis of preliminary inspection of our materials and by frequent discussions, we have established a sequence of archaeological periods, named from the mode of pottery decoration characteristic for each. The Zoned Bichrome period, which includes the Chombo, Monte Fresco, and Catalina phases, is the earliest yet defined, and will be covered by the preliminary analysis presented in this paper. This is followed by the Early Polychrome period, marking the appearance of boldly decorated polychrome ceramics and probably coeval with much of the Classic period to the north. The Nicoya jades and carved effigy metates so well known in public and private collections were associated with Early Polychrome pottery in Hartman's excavations at Las Huacas. The Middle Polychrome period is marked by the appearance of many so-called "Nicoya" polychromes. On the basis of resemblancees to Late Classic Maya ceramics and known occurrences of Middle Polychrome vessels in Mesoamerican tombs as trade pieces, the period might overlap with the last part of the Late Classic and continue through the Toltec ascendency. The sequence is brought to a close by the Late Polychrome period, which apparently persists until the Conquest. Luna Polychrome, diagnostic for the period, has been found in association with Spanish trade goods.

Geographic Background

The outstanding feature of northwestern Costa Rica (Fig. 1) is the Nicoya Peninsula, a 120-km. long proturberance curving out from the mainland in a southeast direction; it is extremely hilly and highly dissected, but with a high population density. A far smaller feature is the Santa Elena Peninsula, a point of land only 25 km. long not far from the Nicaraguan border, and also with a rugged topography.

The coastal zone is deeply indented, with rocky points of land extending towards the sea and enclosing rather small, crescentic beaches. Here the rivers are usually short, and flow between rocky, treeless hills, emptying into tidal estuaries and mangrove swamps. Some coastal valleys and bays are relatively broad, such as Tamarindo Bay, and must have offered to early agriculturalists good land for maize farming as well as the benefits of the abundant fish and mollusks in the estuaries. While today the zone is badly deforested owing to clearance for pasture, in the past it must have supported a fairly dense monsoon tree cover. Coastwise navigation could never have been easy; on most days, a heavy wind creates choppy seas.

Extending in a northwest-southeast direction, the Tempisque drainage is an alluvial plain about 50 km. long and 25 km. wide, and is limited on the northeast by the volcanic Sierra del Guanacaste and on the southwest by the hills of the Nicoya Peninsula and their northern prolongations. The Tempisque River itself flows into the Pacific at the Gulf of Nicoya. Isolated hills (igneous extrusive rock in the north and limestone in the east) are scattered in the plain; some contain caves with evidence of occupation. In the dry season, water is scarce in the Tempisque and its many tributaries, but during the season of heaviest rainfall in September and October, the river overflows and the surrounding lowlands are flooded. Presumably the ancient inhabitants took refuge in the hills from the inundations. While the Tempisque drainage has been severely altered by pasture clearance, the soils are fertile for cultivation. As in most of northwestern Costa Rica, game is plentiful in the remaining brush and along the river banks, especially a very tiny variety of deer. There is also no dearth of fish. The Tempisque River is the natural route between the Gulf of Nicoya and the interior. Even today, boats carry cattle and grain down the river to Puntarenas, the main port of the Pacific coast of Costa Rica. Because of the difficulties primitive voyagers might face in traveling along the coastal zone of the Nicoya Peninsula, ancient trade routes from Nicaragua to the Costa Rican highlands probably passed through this zone.

Chombo Phase

Chahuite Escondido is located on the northern side of the Santa Elena Peninsula, on the east bank of the Río Murciélagos, about a kilometer south of its mouth on Juanilla Bay. This site consists of nine shellmounds of various sizes and amorphous shape, arranged around a sort of plaza. A total of four cuts was made: Cut 1, a 3-by-4 m. trench into the top of the largest shell mound, fronting the river on the west, and Cuts 2, 3, and 4, which were 3-by-3 m. pits distributed over the plaza area to the east of Cut 1. A depth of 4.5 m. was reached in Cut 1 before sterile deposits appeared, while the plaza cuts were terminated at depths around 1.2 m. Pot sherds were abundant throughout all deposits, especially in Cut 1 which appeared to represent a refuse heap composed almost entirely of shell, with many broken fish, mammal, and amphibian bones. Very clearcut natural and cultural stratification was evident in both Cut 1 and in the plaza cuts. There are four well-defined phases at Chahuite Escondido, running in the order from earliest to latest: Chombo (Zoned Bichrome), Santa Elena (Early Polychrome), Doscientos (Middle Polychrome), and La Cruz (Late Polychrome). It was quite obvious that the shellmounds themselves were completely the result of occupations during the last two phases, and that the strata which could be assigned to the first two phases were essentially flat layers of debris.

The major ceramic variety of the Chombo phase is Toya Zoned Incised, a red-and-black-on-natural pottery with very broad lines outlining the color areas (Fig. 2 *a-h*). No sherd is large enough so that one may speak with confidence of over-all design patterns, but they appear to be quite rectilinear and abstract in most cases. Shapes in this variety are confined to jars and to bowls with incurving or outcurving rims. A red-on-buff variety, consisting largely of jars with necks painted red on the interior, is abundant but not yet analyzed. Red-on-buff has a very long persistence at the site and will probably be subdivided into several types after further study. One or two sherds are trade items of the variety Rosales Zoned Engraved, found in great quantity

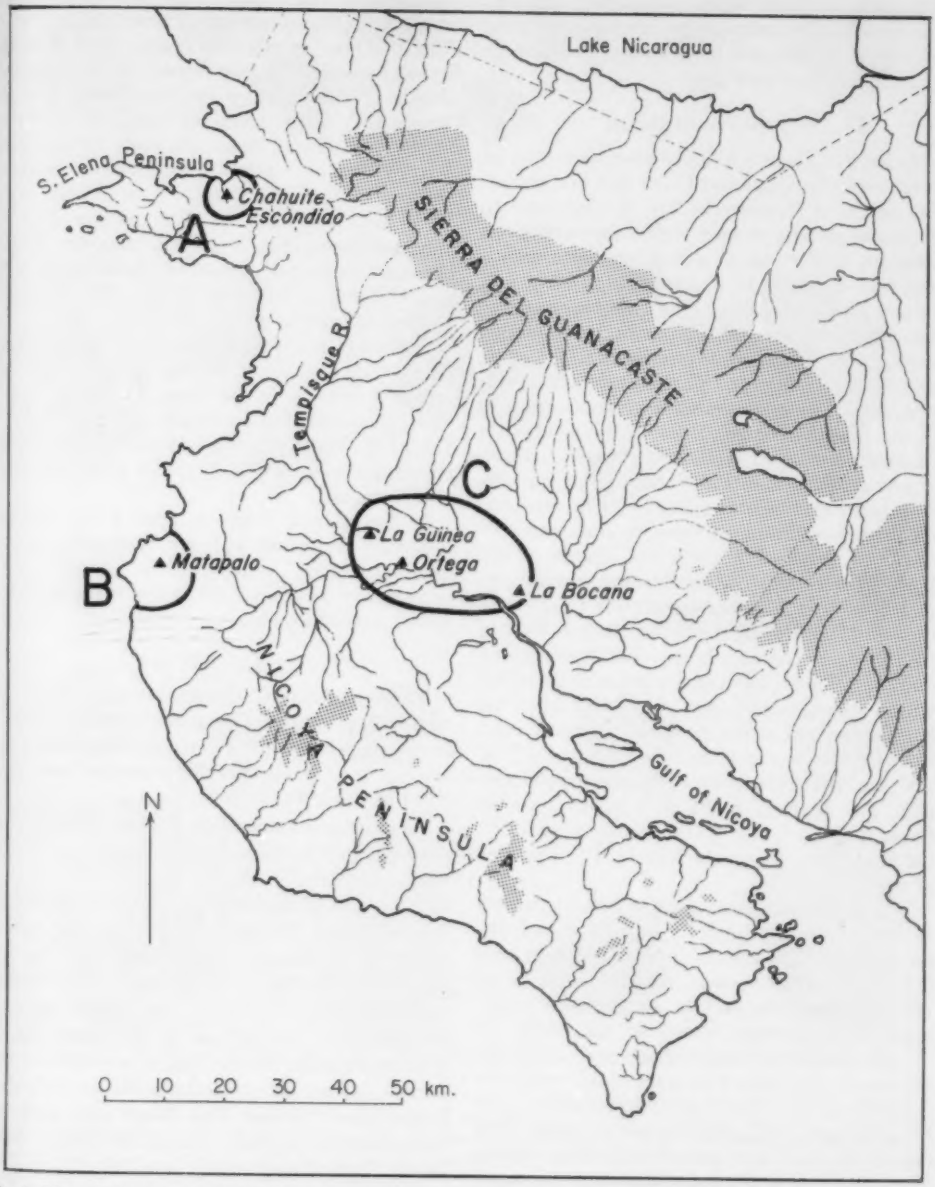

FIG. 1. Map of Northwestern Costa Rica. The stippled areas represent land over 500 meters altitude. A, approximate known distribution of the Chombo phase; B, Monte Fresco phase; C, Catalina phase.

in the Monte Fresco phase of the Tamarindo Bay area. Artifacts other than pottery are rare. No figurines, metates, or manos have yet been identified. Apparently there was no emphasis on the collection of mollusks.

Monte Fresco Phase

In back of about 5 miles of beaches contained between Cabo Velas and Punta San Francisco is the region of Tamarindo Bay. It comprises an extensive estuary system with dense mangrove swamps, to the east of which are bottomlands and hills dissected by a number of streams and by the Matapalo River. This area proved to be extremely rich in sites, 21 having been located during a fairly cursory reconnaisance. The largest and most important of these was the extensive site of Matapalo, extending from the square of the modern village of that name to about a kilometer northwest of the schoolhouse. A group of low artificial mounds of stone lie in approximately the middle of the site, but these were not touched; pothunting in them by the owners of the land revealed nothing but sherds of the Early Polychrome period. Instead, three cuts, each 3 by 3 m., were undertaken in the field to the south of the stone mounds in low rises of land that perhaps were housemounds or midden dumps. A fourth cut was made just north of the village square, but this was abandoned when the deposits proved to be erosional. In these cuts, sherds continued to a total depth of about 2 m. Only two occupations were represented at Matapalo, and there is probably a hiatus between them. These are the Monte Fresco (Zoned Bichrome) and Matapalo (Early Polychrome) phases.

The commonest and most striking decorated variety in Monte Fresco is Rosales Zoned Engraved, a fine, polished, black-on-red with very delicate engraving outlining the color areas (Fig. 2 *v-aa*). The designs are generally curvilinear with perhaps occasional life forms, although simple rectilinear panels with zigzag engraving are frequent. Examples of this variety in the collections of the Museo Nacional de Costa Rica are male and female figurines (Stone 1958, Fig. 11 *d*), and bird and animal effigy vessels. Shapes include bowls and dishes with thickened rims and jars. Another distinctive variety is Obando Black-on-Red (Fig. 2 *q-s*) on which designs are applied in black by a multiple-brush technique in wavy patterns. Necked jars are probably the most common form in the variety, but dishes with outcurving sides (Fig. 2 *s*) are also known. The lines need not always be wavy; in places, some vessels have linear designs in the "hanging line" motif. Also present are a Bocana Zoned Incised sherd (see below), plain engraved sherds (Fig. 2 *t*, *u*), a fragment from a large "cuspidor" with burnished lines on a matte background (Fig. 2 *l*), red-on-white sherds (Fig. 2 *o*, *p*), one example of a jar fragment with a reed-punctated zone (Fig. 2 *n*), and what may be a tiny fragment from a dentate rocker-stamped vessel (Fig. 2 *m*). The majority of the ceramics apparently consist of sherds from buff jars with tall necks or outflaring necks that are slipped red on the interior and rim.

There are few other artifacts. A fragmentary figurine, or possibly an adorno broken from the rim of a bowl, is in the form of a jaguar head with eyes indicated by simple appliqué pellets (Fig. 2 *j*). There is a single specimen of a finely polished stone celt (Fig. 2 *i*) from which the poll half is missing.

In the deepest levels of Cuts 1 and 2, and definitely associated with the Monte Fresco occupation, large, wide-mouthed, necked jars, were found inverted, each containing the skeleton of a newborn child.

Catalina Phase

Three sites with Catalina material were found and excavated during the investigations of 1959–60, two of which were located in the central portion of the Tempisque River valley, and the third in the lower valley.

La Guinea is situated on the very edge of the right bank of the river, 10 km. southwest of the town of Filadelfia. As the terrain is absolutely flat, the annual floods have caused considerable sedimentation. The site is fairly large, measuring about 100 m. square. The cultural zone lies beneath a sterile alluvial layer about a meter deep, and continues to around 4 m. below present ground level. Four 2-by-2 m. cuts were made. The stratigraphy of one had been confused by various pit burials of the Palo Blanco (Middle Polychrome) phase. The other cuts show a succession of Catalina (Zoned Bichrome), San Bosco (Early Polychrome), and Palo Blanco.

Ortega is located 10 km. south of La Guinea, a few hundred meters from the Río Las Palmas. It extends on and around a small and low rocky prominence, the latter measuring 60 m. long by 40 m. wide, and only 2.5 m. high. A single 4-by-

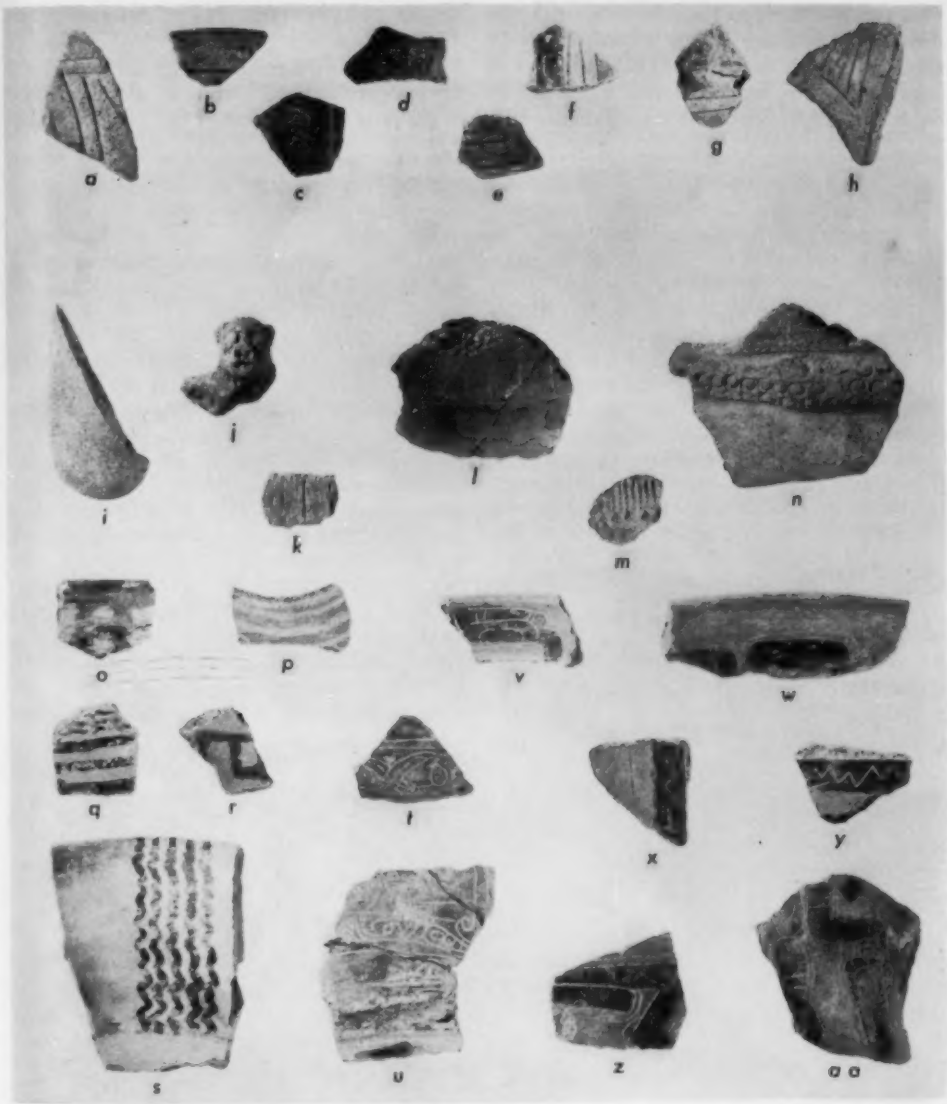

FIG. 2. Pottery and artifacts of the Chombo (*a–h*) and Monte Fresco (*i–aa*) phases. *a–h*, Toya Zoned Incised; *i*, polished celt; *j*, figurine or adorno fragment; *k*, Bocana Zoned Incised; *l*, pattern burnished sherd; *m*, rocker-stamping(?); *n*, reed punctation; *o*, *p*, red-on-white; *q–s*, Obando Black-on-Red; *t*, *u*, simple engraving; *v–aa*, Rosales Zoned Engraved.

4 m. cut was made at the foot of the rise. All sherds recovered are deeply eroded, but were very abundant from 20 cm. to 1.20 m. deep. A large hearth with much charcoal was found at the bottom of the cut. The phases represented stratigraphically at this site are Catalina and San Bosco.

La Bocana. Numerous steep limestone hills are scattered in the lowlands of the lower Tempisque valley. At the foot of one of them, called

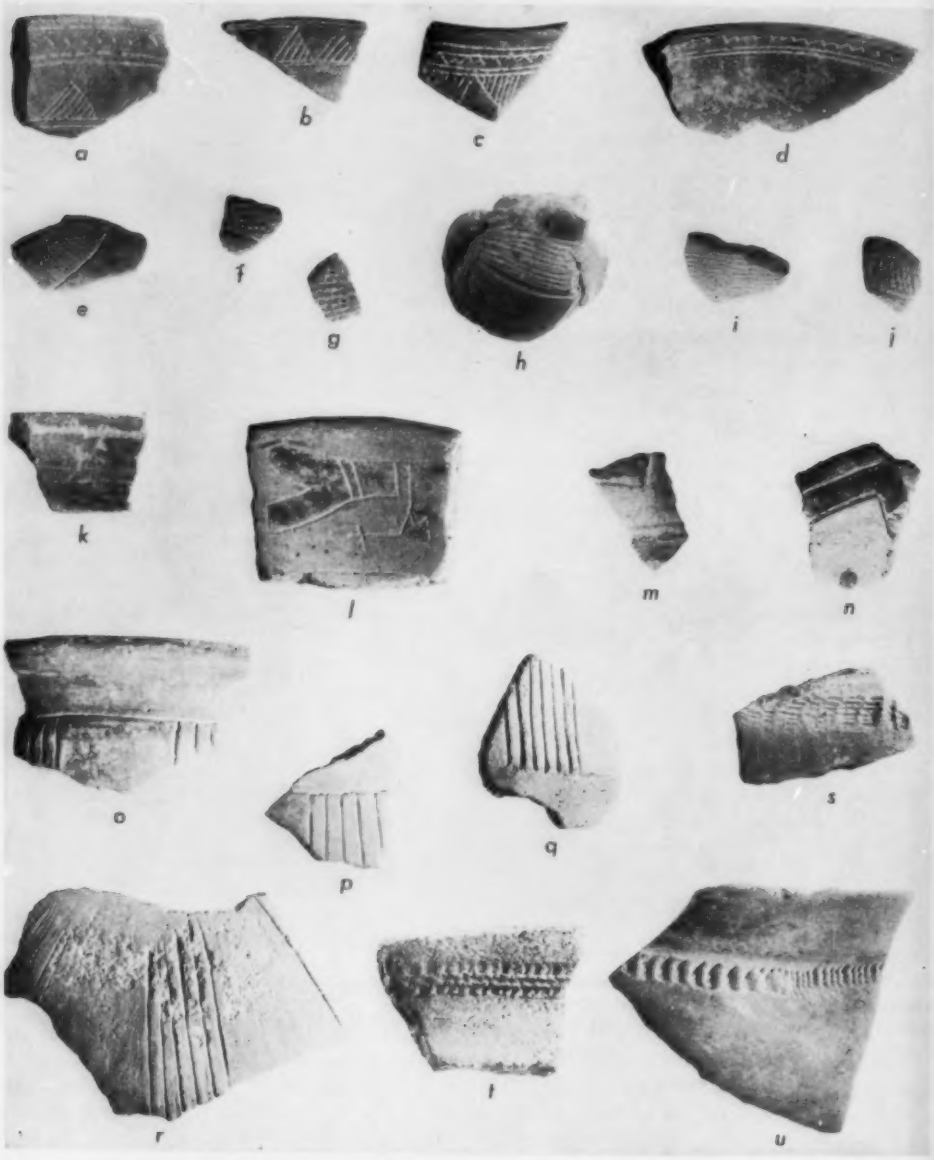

Fig. 3. Pottery of the Catalina phase. *a–d*, Ballena Engraved; *e–j*, zoned dentate rocker-stamping; *k*, *l*, Rosales Zoned Engraved; *m*, *n*, Toya Zoned Incised; *o–r*, Bocana Zoned Incised; *s–u*, Mojica Punctate.

the Cerro de la Bocana, was discovered a small cave, with maximum dimensions of 6 by 6 m. Many Catalina phase sherds were encountered on the surface. The excavations covered 14 sq. m. Cultural deposits continued to the cave bottom, at depths varying from 60 cm. to 1.60 m. About 9000 sherds, most of them well-preserved, stone artifacts, charcoal, and kitchen refuse were recovered, all belonging exclusively to the Catalina phase.

Since only decorated ceramic varieties have been examined, the statements which follow pertain to these alone. Among them, Bocana Zoned Incised, of which at least one sherd was found in the Monte Fresco phase, is most numerous (Fig. 3 *o-r*). It comprises beige to gray unslipped and unpolished globular jars with everted rim and tapering lip. Sometimes composite silhouette bowls with restricted mouth occur. The temper is clearly sand. The decoration is restricted to multiple, parallel, often deep and wide, incisions made in the damp clay, and containing red painted zones. The most common motifs are parallel lines which are horizontal around the neck and vertical on the body of the jar. A characteristic bowl of this variety from Alta Gracia, Nicaragua, is illustrated by Lothrop (1926, Pl. 114 *e*) under the heading "Palmar ware," although it was not among those excavated by Bransford (1881) at the site of that name. Other zoned varieties present in the Catalina phase include Toya Zoned Incised (Fig. 3 *m, n*), found only at the Ortega site and probably traded in from the Santa Elena region, and Rosales Zoned Engraved (Fig. 3 *k, l*), restricted again to the Ortega site and almost certainly imported from the Tamarindo zone.

Several varieties are monochrome, with the decoration limited to surface manipulation. Mojica Punctate (Fig. 3 *s-u*) is relatively common. The only form is the globular jar with everted rim and rounded lip. The surface is unslipped and unpolished, and the decoration is confined to a band around the shoulder of the vessel which bears punctate patterns produced by a fork-like tool, used in a "drag-and-jab" technique. This variety is present at all three sites of the phase. Ballena Engraved (Fig. 3 *a-d*) appears to be a variety very closely related in conception of treatment to Rosales Zoned Engraved, and was found only at the Ortega site. Forms include composite silhouette bowls with constricted mouth and direct rims and jars with everted rim. The surface is gray to black, unslipped and unpolished. Engraving is very much like that in Rosales Zoned Engraved, but occasionally hatched triangles occur. A few zoned, dentate, rocker-stamped sherds (Fig. 3 *e-j*) were

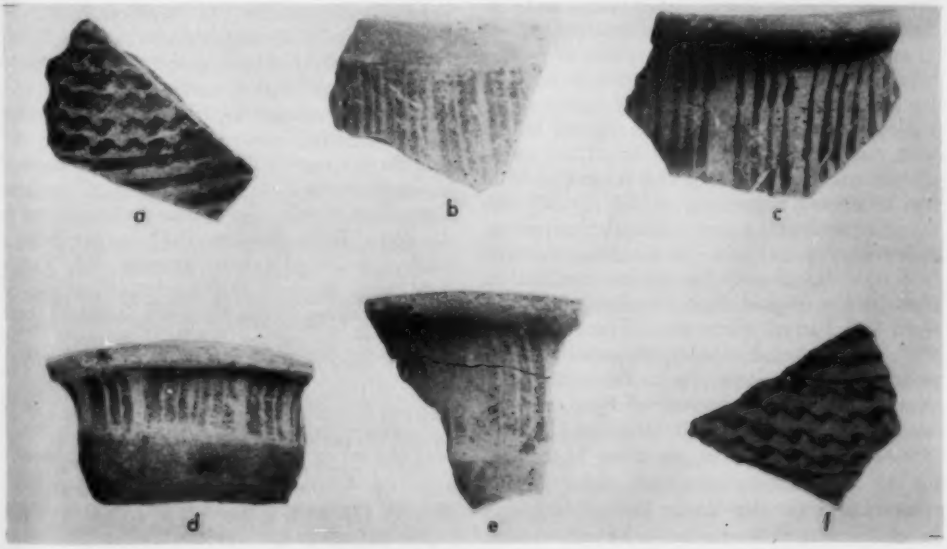

FIG. 4. Pottery of the Catalina phase. *a*, Las Palmas Red-on-White; *b*, *c*, Zelaya Bichrome; *d*, *e*, Zelaya Trichrome; *f*, Charco Black-on-Red.

found in the Catalina levels of the Ortega site. Here the stamping is usually of the most delicate sort. One of the rocker-stamped fragments is evidently part of an effigy ocarina.

As in the Monte Fresco phase, pottery decorated by means of a multiple brush is present. Two of the varieties in the Catalina phase are Las Palmas Red-on-White (Fig. 4 *a*) and Charco Black-on-Red (Fig. 4 *f*), both similar to each other. The only form is the globular jar with everted rim. The former is unslipped and unpolished, the background color varying from cream to light beige; the latter has a red slip which is sometimes polished. Decoration in both consists of straight or wavy parallel lines of red or black applied with a multiple brush, as well as linear designs like the "hanging line" motif. Charco Black-on-Red is quite comparable to Obando Black-on-Red, although some minor differences are evident. It apparently continues into the San Bosco phase, with modifications such as polishing. Zelaya Bichrome (Fig. 4 *b*, *c*) and Zelaya Trichrome (Fig. 4 *d*, *e*) are also sibling varieties. The only form is a large "cuspidor" bowl, and the decoration consists of groups of three or four vertical black lines applied with a multiple brush to the neck of the vessel. In the Trichrome variety, the region of the neck is unslipped, with the rest of the bowl covered by an unpolished red slip. On the other hand, Zelaya Bichrome has an over-all, unpolished red slip. The latter is entirely confined to the Catalina phase, while the former starts out as a very minor variety, to increase in importance during the San Bosco A subphase.

Neither extensive midden heaps nor burials were encountered. The only important refuse deposit encountered was in La Bocana cave. It was composed principally of fish bones, with mammal and bird bones in smaller quantities. A few bivalve mollusks also occurred. Agriculture was undoubtedly present in the Catalina phase, since fragments of three-legged metates were found in all three sites. The only stone tools are unaltered cobbles, the smaller being polishers, and the larger, hammer-stones. Some adornos and a small number of figurines were encountered. They are all zoomorphic, representing jaguars, alligators, peccaries, birds. Simple buttons of clay indicate eyes as in the jaguar representation in the Monte Fresco phase, but in one instance these are shown by perforations. It should also be mentioned that a few solid legs from tripod vessels are ascribable to Catalina.

Chronology and Inter-areal Comparisons

Two radiocarbon dates are available for charcoal samples pertaining to the Monte Fresco phase at the Matapalo site. One of these, A.D. 430 (Y–809, 1530 B.P. ± 280), is believed to have been contaminated with modern air through a laboratory error and may be disregarded. The other (Y–810, 1870 B.P. ± 200) is A.D. 90 with a one-sigma range of 110 B.C. to A.D. 290. This would be completely coeval with the Late Formative of Mesoamerica and of Peru. Since all three phases defined thus far are known from the evidence of shared ceramic varieties to be at least in part contemporary with each other, it may be inferred that the Zoned Bichrome period of northwestern Costa Rica can be placed within this time span.

In lower Central America the assemblage most closely comparable to our materials is the so-called "Palmar ware" recovered from burials at Palmar, Department of Rivas, Nicaragua (Bransford 1881; Lothrop 1926: 248–9, Pl. 114). This site is only about 50 km. from Chahuite Escondido, the type site of the Chombo phase. The vessels and sherds of this group, all examined by Coe in the U.S. National Museum, are largely red-on-natural zoned incised. The "Union Jack" vessel pictured by Lothrop (1926, Pl. 114 *f*) is a wide-necked jar with a body which resembles Toya Zoned Incised and a neck with vertical stripes much like those on Zelaya Bichrome and Trichrome. Viewed as a whole, the Palmar vessels recall forms and decorative techniques such as bottles, neckless jars, color zoning which occur at Tlatilco, Valley of Mexico (Porter 1953).

Lothrop's material from the deepest levels of his excavations in the Diquis delta of southern Costa Rica would also appear to be related to the Zoned Bichrome period. Quite comparable to Bocana Zoned Incised are jars and "cuspidors" with zones of multiple, parallel, incised lines. However, in the place of color zones there are groups of incised appliqué buttons. The earliest Diquis figurines are remarkably like those of the Zoned Bichrome period in northwestern Costa Rica, particularly in the use of simple flat pellets of clay to indicate the eyes.

In the Chiriquí area of Costa Rica and Panama, the group dubbed "Scarified Ware" by Holmes (1888) is quite similar to some of our zoned bichrome varieties, especially to Bocana Zoned Incised. Here again zones of parallel incised lines are opposed to red-slipped areas; as

one moves south on this early horizon, it is interesting to note that the incised areas increase in size at the expense of the color areas. Scarified Ware may even have over-all herring-bone patterns of incised chevrons. What is different here is the presence of crude loop handles, apparently unknown in northwestern Costa Rica in this time period. A radiocarbon date of 230 B.C. ± 60 has recently been obtained on charcoal from a shaft grave containing Scarified Ware (Lothrop 1959, Table 1). If this date is valid, this kind of zoned incising may be the earliest in lower Central America.

Sherds of Scarified Ware appear as a minority type in the Aguas Buenas complex in the Chiriquí region (Haberland 1959), along with a quantity of zoned-incised, red-on-natural pottery. Also present are monochrome vessels with hollow tripod feet and profuse appliqué ornamentation, along with large loop handles with appliqué rings and faces, apparently broken from jars. The problem here is that the monochrome sherds are extremely similar to Early Polychrome monochromes of the Tamarindo zone. It may be that the Aguas Buenas deposits were mixed through some agency, for while the red-on-natural pottery could be on the same time level as the Zoned Bichrome period, the monochrome material clearly is not. The Scarified Ware might belong with an even earlier phase.

Zoned bichrome ceramics may well prove to be distributed on an early level over much of Costa Rica and adjacent regions of Nicaragua and Panama. Bichrome vessels without good site provenience turn up occasionally in collections from various parts of Costa Rica. For instance, a necked jar with black-on-red zones outlined by fine engraving, much like, but not identical to Rosales Zoned Engraved, apparently was found in the vicinity of La Unión, in the section of the eastern slopes of the Cordillera Central called the "Línea Vieja." A number of peculiar red-on-natural zoned jars also are assigned by San José antiquity dealers to the same region. Instead of having zones of vertical incised lines, these jars have zones of raised parallel ridges. In feeling, they recall our earliest ceramics of northwestern Costa Rica. It might also be added that zones of raised ridges appear on the prepolychrome Sarigua sherds from the Parita Bay area of Panama (Willey and McGimsey 1954, Fig. 29).

In Mesoamerica, the kind of black-on-red zoning that was characteristic of both Toya Zoned Incised and Rosales Zoned Engraved appears on the Late Formative Utatlán Ware of the Guatemalan highlands (Lothrop 1936, Fig. 74 *b*, *b'*, Pl. 5 *b*). There may be two varieties within the ware; one has rather broad incised lines as in those figured by Lothrop, while the other has fine engraving like that present on Rosales Zoned Engraved. Utatlán Ware, of which many examples exist in the Dieseldorff collection in the Museo Nacional de Arqueología e Historia in Guatemala City, seems to have been manufactured in the Salcajá area of the western highlands. It appears as a minority type in the fill of a Providencia phase mound at Kaminaljuyú where a radiocarbon date of A.D. 110, or A.D. 50–170 within the one-sigma range (Y–370, 1850 B.P. ± 60, Deevey, Gralinski, and Hoffren 1959), is remarkably close to the date for the Monte Fresco phase in which Rosales Zoned Engraved is one of the important types. We believe it is likely that there has been some connection between the two regions in the past.

The multiple brush technique is also a feature of the Late Formative in the Maya area, where it was used to produce the negative decoration known as Usulután; this reaches its greatest frequency in Guatemala and El Salvador, although it is known on an early level as far south as Nicaragua. As in our Costa Rican varieties, the parallel lines produced are usually wavy.

The very few rocker-stamped sherds found establish the first early occurrence of this technique which almost certainly has a single diffusion history in Nuclear America, beginning with the Ocós phase of Guatemala (about 1400–800 B.C.), and appearing in Peru with the first Chavín horizon ceramics (about 800 B.C.) Its presence in northwestern Costa Rica suggests that eventually an almost unbroken distribution of rocker-stamping on a Formative level from Mesoamerica to the Andean area will be established. Much of lower Central America and the Isthmian area is yet an archaeological blank, so that the present gap between the Tempisque drainage and the Momíl culture of Colombia (Reichel-Dolmatoff 1956) may be some day closed.

The color zoning so characteristic of the Zoned Bichrome period also bears likeness to that present in a number of Formative ceramic complexes in western South America. Among these are the Chorrera phase of the Guayas

Basin region, southern Ecuador (Evans and Meggers 1957), the Chavín pottery of the type site itself (Bennett 1944), the Juan Pablo, Ocucaje, and Proto-Nazca styles of south coastal Peru (Strong 1957), and the Pucara phase in the Tiahuanaco Basin (Kidder 1943). All with the exception of Chorrera and Chavín, which are demonstrably earlier, are on the Late Formative level in the Andean area, from the evidence of recent radiocarbon dates, and are probably contemporary with the Zoned Bichrome period. This trait has far less specificity than rocker-stamping, but may also represent a feature widely diffused among Formative peoples of Nuclear America.

Summary and Conclusions

The Zoned Bichrome period is defined on the basis of materials excavated at sites in the coastal regions and the Tempisque drainage of northwestern Costa Rica. Two phases in the coastal zone — Chombo on the Santa Elena Peninsula and Monte Fresco on Tamarindo Bay — are stratigraphically below all other regional cultures; likewise, in the Tempisque drainage, the Catalina phase is the earliest yet known. All three of these are fully ceramic, probably representing the remains of people with maize agriculture. Fishing and hunting were of some importance, the latter carried out without the benefit of stone projectile points. The gathering of mollusks on the coast, so significant in later times, was of no consequence in this period. The majority of sites represents simple villages, but on the Middle Tempisque some groups occupied caves, perhaps during seasonal floods. No adult burials have been discovered, but in the Monte Fresco phase small children were interred in inverted jars.

The characteristic ceramic technique of the period is bichrome zoning, with the employment of lines that may be engraved or incised. The colors used are red and black, although in some varieties red and natural, or a combination of all three may be employed. Rocker-stamping is certain for only the Catalina phase. Other decorative techniques include fork punctation, reed impression, and simple engraving. Straight and wavy black or red lines produced by a multiple brush technique are frequent, and mark the beginning of a long ceramic tradition in northwestern Costa Rica. In the Catalina phase unzoned bichrome painting is found, and the beginnings of a trichrome technique which is too simple to call polychrome. The usual vessel shapes are necked jars and composite silhouette "cuspidors." Figurines and adornos occur, and are hand made with crude features indicated by clay pellets.

The period represents the earliest pottery-making culture known thus far in this part of lower Central America. It can hardly be the first occupation of the area, however. Two fluted points definitely can be traced to Guanacaste Province (Swauger and Mayer-Oakes 1952; Bosch-Gimpera 1959: 139), and a brief inspection by Coe of the sides of gullies cut by intermittent streams near the coast indicates that hearths are found in the exposed gravel series themselves. Certainly cultures on the Archaic (food collecting) level are yet to be discovered, for the region must have offered attractive prospects to early fishermen and mollusk eaters. One might also expect terminal Archaic collectors to have pottery like that found at Monagrillo in Panama. Likewise, there may yet be early sites in northwestern Costa Rica which are contemporary with Early and Middle Formative horizons elsewhere in Nuclear America, marking the intensification of maize agriculture.

On the Late Formative level, we have found that the region was participating in some, but not all, of the diffusional currents operating then and earlier between Mesoamerica and western South America. Recent evidence (Coe 1960) suggests that the major means of dispersal of cultural elements in Nuclear America was trade via long-range sea voyages, along the Pacific coast; apparently (but this has yet to be proved, since negative evidence cannot be conclusive in such an unknown area) this trade largely missed Costa Rica.

Willey (1959) lists rocker-stamping, incised outlining of painted zones, and hand-made pottery figurines among the elements diffused on a Formative level throughout Nuclear America and postulates a Mesoamerican origin for these and other traits. He points out:

> Whatever the point, or points, of origin for these Formative pottery traits, the most curious gap in the over-all Nuclear American distribution is Lower Central America. Except for Monagrillo, which has a Preformative or sub-Formative appearance, there is no archaeological complex between Salvador-Honduras and northern Colombia which has the typological or chronological attributes of the Formative period. I am inclined to think that the evidences must be here although they have not yet been isolated.

The Zoned Bichrome period fills part of this gap, and as Willey (1959) points out, so does the Scarified Ware complex. The village-living, agricultural peoples of this time in Lower Central America were obviously participating in the diffusion of some important Nuclear American traits, but certainly not the spectacular ones that we find in the advanced cultures of the Olmec and Izapan zones in Mesoamerica and in the Chavín horizon in Peru.

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A LONG ARCHITECTURAL SEQUENCE AT TEOTIHUACÁN*

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ABSTRACT

A series of superimposed structures spanning the Preclassic, Classic and Postclassic periods was uncovered in 1959 in the Oztoyahualco zone of the ancient city of Teotihuacán in the Valley of Mexico. Superimposed structures spanning so long a period have not previously been found in the Valley. The earliest structures in the sequence are earth floors of the Tzacualli (Teotihuacán I) phase, beneath which were found a number of caches of broken pottery and other objects. These are followed by massive, concrete, ceremonial structures of the Xolalpan (Teotihuacán III) phase and above these are structures built after the fall of Teotihuacán. The nature and distribution of these successive structures is such as to suggest that the locality became sacred in Tzacualli times and maintained this sacred character even after the fall of Teotihuacán. The Tzacualli structures receive primary attention in the discussion because of their importance.

IN THE summer of 1959 a long sequence of structures was uncovered at Teotihuacán, the great urban center in the Valley of Mexico during the early centuries of the Christian era. The new sequence appears to have stretched from the earliest Teotihuacán period (Tzacualli or Teotihuacán I) to late pre-Spanish times, a period of perhaps 1500 years. Above a series of Tzacualli structures were three structures of the great period at Teotihuacán (Xolalpan), and above these at least three structures built after the fall of Teotihuacán. The site of these successive structures was evidently sacred in Tzacualli times and maintained its sacred character throughout the life of the city, and apparently for hundreds of years after its fall, though it was not continuously in use during all of that time. Superimposed structures covering this great span of time have not previously been found at Teotihuacán or elsewhere in the Valley of Mexico.

The site of these successive structures is the South Platform of Plaza 1, in the Oztoyahualco zone of the ancient city, 800 m. northwest of the northwest corner of the Pyramid of the Moon. The Oztoyahualco zone is a large region to the northwest of the Pyramid of the Moon, which we determined to be part of Teotihuacán in 1957 (Fig. 1; also Millon 1960, Fig. 1). Plaza 1 is a small platform approximately 100 m. square (Fig. 2). Small mounds are situated on its western, northern, and eastern sides (Mounds A, B, C, respectively). These mounds were recorded on the 1865 map of Teotihuacán (Almaraz 1865; Peñafiel 1899, Pl. 1), but did not thereafter receive attention in the literature. The largest, Mound B, at the north edge of the plaza, is some 6 m. in height. The South Platform (Mound D) is a low, elongate mound which extends along the entire south edge of the plaza and barely rises above the enclosed plaza floor (Fig. 2; also Millon 1960, Fig. 2).

When we found Plaza 1 in 1957 the pottery on its surface was overwhelmingly of the Tzacualli or Teotihuacán I phase of occupation of the ancient city. We were looking for just such concentrations because no major zone of occupation belonging to this earliest phase had yet been found at Teotihuacán. This was anomalous since there were reasons for believing that the largest structure in the city — the Pyramid of the Sun — had been built during the Tzacualli phase (Millon 1960). Our investigation of the Oztoyahualco zone had been designed to clarify this problem.

Plaza 1 thus seemed the logical place to look for simple constructions belonging to the Tzacualli phase. Late in the summer of 1957 two test pits were excavated there by Millon, with the assistance and cooperation of Carmen Cook de Leonard of the Centro de Investigaciones Antropológicas de México (Millon 1957). Test Pit 1 was unproductive, but Test Pit 2, in the South Platform, revealed a series of earth floors made during the Tzacualli phase (Fig. 2). Two caches of deliberately broken pottery, including several nearly whole vessels, were found beneath these floors (Millon 1960, Figs. 3, 4). Although time did not permit further explorations, the early occupation of the site had been confirmed. Shortly thereafter Carmen Cook de Leonard and Juan Leonard began a series of major excavations in the South Platform and in Mounds B and C which extended over a period of two years. The trenches made by Cook de Leonard in the South Platform are indicated in Figure 2; a preliminary report on these excavations has been published by Cook de Leonard (1957). The excavations in Mounds B and C are not shown in Figure 2, but are briefly described by Nicholson (1959: 306; also Stuiver, Deevey, and Gralenski 1960: 57).

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Because of the evident importance of Plaza 1 we decided to undertake further excavations in the South Platform when we returned to Teotihuacán in 1959. Five pits were excavated along the north edge of the platform, west and north of Test Pit 2 (Fig. 2). In spite of the small size of the excavations, a long sequence of construction was revealed. No detailed ceramic analysis has yet been attempted, and many problems must await more complete exposure of the

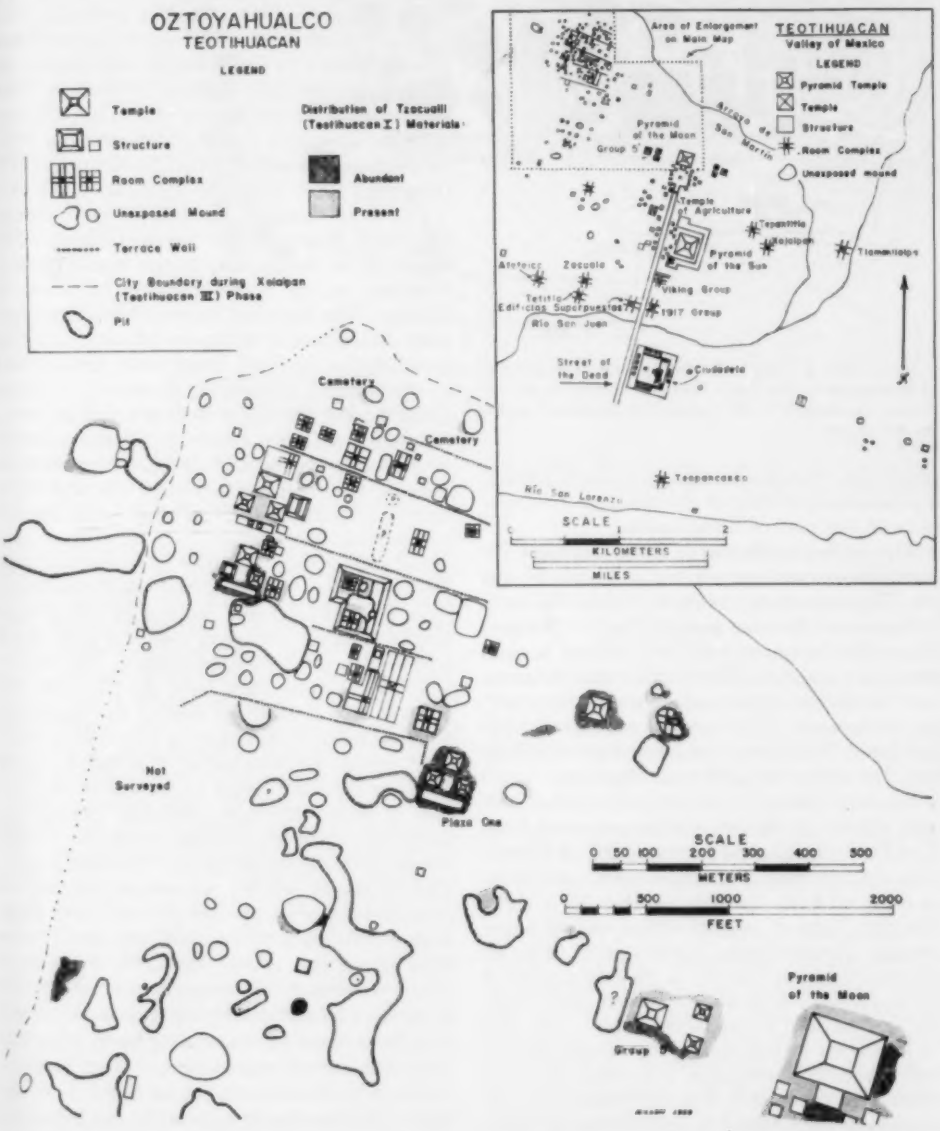

FIG. 1. Map of Oztoyahualco, the northwestern zone of Teotihuacán, surveyed in 1957 and 1959. Inset map shows most of the known area of Teotihuacán. Boundaries are known only for the Oztoyahualco zone. Exposed structures in the southeastern part of the city continue for at least one-half kilometer beyond the inset map.

Fig. 2. Map of Plaza 1, Oztoyahualco, showing location of excavations in the South Platform. Extensive and important excavations by the Leonards in Mounds B and C are not shown.

structures. Nonetheless, it is possible to present a preliminary outline of the successive occupations of this part of Teotihuacán.

The earliest evidences of structures were the earth floors previously found in the 1957 test pit. These are shown as Floors 1–4 in the lower left corner of the cross section (Fig. 3). We now know that the uppermost "floor" which we had previously designated Floor 5 consisted of laminated, water-laid deposits of volcanic ash and was not man made. This determination was made by Howel Williams of the Department of Geology, University of California, Berkeley.

Six more caches of deliberately broken pottery, similar to the two caches recovered from Test Pit 2, were found in pits sealed by Floor 3 (Fig. 4). At least one whole vessel can be reconstructed from these sherds (Fig. 5), and the complete form of several others can be determined. These vessels, together with those reconstructed from Test Pit 2, provide a series of vessel forms of both decorated and plain wares for the earliest Teotihuacán phase. This will be important in establishing the relationships of the Tzacualli assemblage with material from other sites, since whole Tzacualli vessels had not previously been found in excavations at Teotihuacán. Preliminary inspection of the ceramics and figurines found below the water-laid floor-like deposit indicates at most a sub-phase variation from the Tzacualli ceramic assemblage found in the interior of the Pyramid of the Sun (Noguera 1935). Certainly it is clear that the pottery from Oztoyahualco is much more closely related to the latter than it is to the earlier El Tepalcate assemblage, Armillas' Chimalhuacán phase (Noguera 1943; Armillas 1950: 60, 67). It is also worth noting that we found no Thin Orange pottery in our Tzacualli deposits nor in our excavations in the Pyramid of the Sun. This supports the accepted view that Thin Orange does not appear at Teotihuacán until the Miccaotli phase (Armillas 1944: 128; Noguera 1935; compare Tolstoy 1958: 19–20, 56, 65–6, 83, 85).

The four Tzacualli floors were quite extensive, since they could be followed for an additional 10 m. to the east in the trench system excavated in the South Platform by Cook de Leonard. The nature of the structures associated with these floors is unknown because no walls, post holes or terminal limits were encountered in our limited exposures. However, it seems probable that the floors were covered by structures of some sort. None of the three lowest floors shows any sign of natural deposition or erosion. Floor 4 was covered by the water-laid floor-like deposit (Fig. 3). This is one reason we believe that the earlier floors had been protected. It appears that the covering structure (or structures) was removed some time after Floor 4 was laid down, perhaps in preparation for the building of a larger structure since there is no evidence of structural collapse. The water-laid "floor" must have been deposited in this interval. On a localized area of the water-laid level we found a thin layer of very friable dried mud, which was cracked as if it had been exposed to the sun. Since its surface showed no sign of wear, this layer probably formed immediately prior to a major alteration of the South Platform made by the Tzacualli people. The thickness of the water-laid deposit increased from west to east; it was never more than 8 cm. thick in our pits but was 16 cm. thick at the east end of the Cook de Leonard trench system. This suggests that the earth floors were surrounded by higher structures, and that Floor 4 served as a settling basin when the water-laid deposit was formed.

The fill immediately below Floor 3 in the South Platform made by the Tzacualli people. adobe and large slabs of it were found in one concentrated area. As far as could be determined, this material merely represented rubble

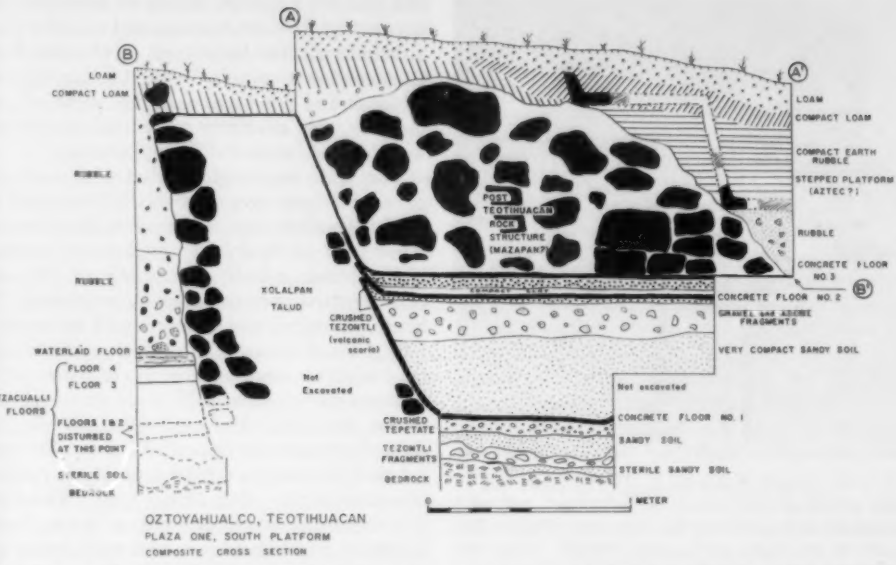

FIG. 3. South Platform, Plaza 1. Composite south to north cross section of 1959 excavations showing superposition of structures. The A–A′ portion of the cross section includes everything above concrete Floor No. 3 and to the right of the Xolalpan *talud*. It is 5 m. west of the lower (B–B′) part of the cross section (Fig. 2). Only the northernmost 3 m. of the B–B′ cross section are shown above.

incorporated in the fill. There was no evidence that these building materials were related to any of the floors of the South Platform, but their presence indicates that structures of adobe and wattle-and-daub were being made somewhere in the vicinity while the earth floors were used.

The major alteration which we believe took place shortly after the formation of the water-laid "floor" consisted of a rubble fill of adobe and *tepetate* chunks, along with fragments of an adobe concrete, some of which were painted orange-red. This layer appears as the deeper of the two rubble layers at the left edge of the cross section (Fig. 3). Only Tzacualli sherds were found in the rubble. The fill must have covered the water-laid "floor" within a reasonably short time after its deposition, since the laminated volcanic ash is undisturbed and capped by a thin, fragile layer of fine silt which could not have withstood prolonged exposure without profound alteration. The nature of the structure formed by the rubble fill is unknown and may never be determined, because it was apparently subjected to severe erosion after this portion of the side was partially abandoned, some time before the end of the Tzacualli phase.

Structures of the Tzacualli phase have also been reported by the Leonards in their excavations in Mounds B and C. Charcoal from the interior of Mound B has yielded a radiocarbon date of A.D. 30 ± 80 (Y–644) for the Tzacualli phase at Plaza 1 (Stuiver, Deevey, and Gralenski 1960: 57; also Nicholson 1959: 306).

The abandonment of Plaza 1 seems to have coincided with partial abandonment of the Oztoyahulaco region at what was probably the end or close to the end of the Tzacualli phase. No ceramic or figurine types diagnostic of the Miccaotli (Teotihuacán II) phase were found in our excavations. Likewise an intensive survey of a major part of the Oztoyahualco zone to the west and north of Plaza 1 failed to produce any evidence for extensive occupation during the Miccaotli phase (Millon 1961). It is possible that this partial withdrawal from Oztoyahualco coincided with the building of the great pyramids along the Street of the Dead, and that a general population shift occurred at this time. Whatever the cause, the region seems to have been thinly populated for a considerable period of time and not to have been intensively occupied until the city expanded north and west

Fig. 4. Cache 3, South Platform. The cache was located in deposits of the Tzacualli phase below Floor 3 and behind the *talud* of the Xolalpan phase (Fig. 3). The pottery in the cache, as in most Tzacualli caches, was deliberately broken before the offering was deposited.

of the Street of the Dead during its florescence in the Xolalpan (Teotihuacán III) phase.

At this time Plaza 1 was again occupied and made the site of a small but impressive religious complex. A sunken plaza was formed by cutting through the three uppermost Tzacualli floors. It was paved with lime concrete and bounded on the south by a sloping concrete wall, a typical Teotihuacán *talud*. The nature of the other boundaries of this plaza has not yet been determined. This structure was rebuilt twice, presumably during the Xolalpan phase. The third concrete structure was 65 cm. above the first (Figs. 3, 6, 7). Fragments of thin stone slabs (*lajas*) found in place indicate that the third concrete wall was capped by a typical Teotihuacán *tablero*; presumably all three concrete walls displayed the *tablero-talud* form of construction. Lime plaster was also found in several places on the top of the uppermost concrete floor (No. 3), and undoubtedly originally covered the surfaces of the earlier concrete structures. The section of the uppermost *talud* which we exposed was 10 m. long and was flanked on both its east and west sides by platforms with vertical walls extending to the north.

A series of major constructions seem to have been carried out at this time in the three mounds forming the remaining sides of the Plaza 1 complex (Mounds A, B, and C in Fig. 2). We did not excavate in any of these mounds, but part of Mound A is exposed and the Leonards have cleared large areas of Mounds B and C, revealing a complex series of stairways and *tablero-talud* constructions. All three of these mounds were evidently pyramidal temple platforms, stone-faced and lime-plastered.

The uppermost *tablero-talud* structure in the South Platform was probably in use until the fall of Teotihuacán. It seems to have been exposed for a relatively short period of time thereafter, during which concretions of lime and earth formed over the floor in front of it. The South Platform was then re-used by a people who built a major platform structure against the Xolalpan *talud* and on top of its associated concrete floor. Some 1.75 m. of the south edge of the Xolalpan plaza were filled in, and both the *tablero* and the upper portions of the vertical-walled Xolalpan platforms were probably removed at this time (Figs. 3, 6). The fill of this structure was composed of large, freshly fractured basalt boulders, vesicular basalt cobbles, and chunks of *tepetate*, bound together with a mud mortar. A vertical rock wall formed its northern facing, the upper portions and outer surface of which are now gone (Figs. 3, 6).

The sherds from this platform structure have yet to be studied, but preliminary examination has revealed a scattering of Xolalpan sherds

Fig. 5. Dish, white-on-red on yellow-brown, Cache 3. Base slightly concave to flat; rim, flaring. Note the asymmetry: opposite halves of the vessel interior have been painted white-on-red, leaving the upper portion of the bottom of the dish and the lower portion of its rim undecorated (yellow-brown). Maximum diameter, 21 cm.

plus one unmistakable Mazapan Red-on-Buff sherd. This ceramic evidence, when taken in conjunction with the nature of the construction (discussed briefly below), strongly suggests that the structure post-dates the fall of Teotihuacán. Since it was built on the Xolalpan floor facing the plaza, and since the Xolalpan plaza floor in front of it continued to be used by the builders of the platform, it seems reasonable to assume that the ceremonial character of the site was maintained by its later occupants. In view of the fine state of preservation of the Xolalpan floor and the absence of any sign of an intervening fill, it seems likely that the rock-filled platform was built no later than Mazapan.

This platform in turn seems to have been abandoned and to have suffered a period of erosion. The next occupants of the site built a crude adobe brick structure behind it which abutted on the rear of the still-standing Xolalpan *talud*. This structure is of unknown size and function and is the only structure in the sequence which we cannot reasonably conclude was ceremonial (Fig. 7). Some time thereafter a cylindrical rock-lined pit, a meter in diameter, was cut through part of the adobe brick structure, penetrating to the top of the water-laid Tzacualli floor. The interior wall of the pit formed a relatively smooth surface, but the stones forming it were not shaped nor is there any evidence that mortar or plaster of any kind was used to hold the structure together or to line it. The pit was sealed by a plug of large rocks, which suggested that it might contain an offering, but it proved to contain nothing at all.

The final structure in the sequence is a stepped platform mound surfaced with a poor concrete. It overlay the rock-filled platform structure and, like it, opened on the Xolalpan plaza. So far as we can tell from the nature and location of the latest structure, it too was ceremonial in nature and utilized the Xolalpan plaza (Fig. 3). Only scattered fragments of its concrete surface remained in place in our westernmost pit, therefore making it difficult to distinguish the hearting of this structure from the capping overburden. Aztec sherds were found in its upper part near the surface, but these may post-date the collapse of the structure.

In general we were struck by the evidence for a marked decline in the manner of construction of the edifices on the South Platform follow-

FIG. 6. Exposed *talud* and concrete Floor (No. 3), Xolalpan phase, South Platform. Foundation stones of facing of later (Mazapan?) structure may be seen on the concrete floor, right. The section of balk in the foreground demonstrates the nature of the rock fill comprising this structure (Fig. 3).

ing the fall of Teotihuacán. The Xolalpan structures were all built of an excellent durable lime concrete and in places even its plaster surface was preserved. The rock fill which formed the backing of the Xolalpan *talud* was held together by a mud mortar which was hard and dense. In contrast to this the rock fill of the possible Mazapan platform was held together by a rather friable mud mortar. No concrete surface or remnants of such a surface were found associated with this structure. It is possible, of course, that whatever remained of its outer surface was removed when the latest structure was built. The concrete in the latest structure is extremely poor and contrasts sharply with the fine concrete from the Xolalpan structures. No doubt the fact that it was the exposed outermost structure made it more subject to disintegration. Nevertheless, it is clear from close inspection of well-preserved specimens that the later concrete is markedly inferior to the Xolalpan. It crumbles easily and gives a general impression of shoddy construction.

Fig. 7. Detail of superimposed *taludes*, South Platform, showing three successive buildings of the Classic period illustrated in Figure 3; exposed Postclassic period rock-lined pit in the background. Some of the stones from the west side of this structure were removed to permit excavation of its interior, forming the gap visible at the right. Immediately to the right of the rock-lined pit fragments of adobe walls may be seen in the rear.

This general decline in the quality of the buildings on the South Platform is not surprising, since Teotihuacán was never again a great urban center after its fall at or near the end of the Classic period. Thereafter our evidence from the South Platform and from the Oztoyahualco region as a whole, together with evidence from other parts of the city, indicates that Teotihuacán continued to be an important focus of occupation, subject to fluctuations of an undetermined nature. But it never regained its former eminence. It does, however, seem to have retained a special sacred character down to the time of the Spanish Conquest (for example, Paso y Troncoso 1905 and Nuttall 1926). It is possible that this special sacred character is reflected in the location and nature of the later structures on our South Platform. It is curious, nevertheless, that this platform, situated so far from the Street of the Dead and the central area of the ancient city, continued to occupy a place of importance after the collapse of Teotihuacán as a great urban center.

To sum up, the 1959 South Platform excavation reveals a large part of the history of the Valley of Mexico in capsule form. We begin with simple floors of earth, probably dating from the time of Christ or earlier. These floors show no sign that people lived on them and were probably the floors of simple religious buildings. Beneath them offerings of pottery were made from time to time. These floors were made by the people who first intensively occupied Teotihuacán. It was then that the distinctive civilization of Teotihuacán was coming into being and taking its form. Next we find massive, ceremonial structures, built of stone, capped with good concrete and surfaced with fine lime plaster. These were built during the florescence of Teotihuacán civilization, when the early settlement had grown into a huge city, covering at least five square miles. Teotihuacán was then the greatest city in central Mexico and had extended its influence in varying degrees over a large part of Mesoamerica. The next structure we find follows the fall of the city and marks the end of Teotihuacán as a great urban center. Like its predecessors it seems to have

been a ceremonial building. The people who built it may have chosen the site deliberately because the memory of the religious character of the locale before the fall of Teotihuacán was still fresh. Later, probably following another period of abandonment, another major building was erected on the same spot. Built perhaps in the last few hundred years before the Spanish Conquest, it was markedly inferior in manner of construction to the earlier buildings dating from the apogee of Teotihuacán. Despite the make-shift character of its construction, its builders seem still to have regarded the locale as sacred — for it, too, was oriented in the same direction as the Xolalpan and later buildings had been, and like them opened on the same plaza. It is likely that its sacred character was effectively extinguished only by the Spanish Conquest.

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MINIATURE PERUVIAN SHIRTS WITH HORIZONTAL NECK OPENINGS

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ABSTRACT

Three miniature cotton shirts, found among the textiles of the Uhle collection from beneath the Temple of Pachacamac, in the University Museum, Philadelphia, show an unusual style of tubular construction in which the warp yarns run horizontally and the neck and arm apertures are located along the upper edge of the shirt. Apparently falling in Uhle's early classification of "Epigone Style" these miniatures show the same general garment form as that of a large shirt reported from the La Capilla cemetery of Hacienda Marques, and in addition, display pleats and a yoke-like use of warp-wise bands seen in a few garments of a related style reported from Piedras Gordas and Huacho, the latter presumably of later date than the former. Although the miniatures are sufficiently sturdy to have served as doll clothing, their purpose is unknown.

AMONG the textiles excavated at Pachacamac by the late Max Uhle (William Pepper Expedition for the University of Pennsylvania, 1896) are three miniature shirts which are distinguished by having horizontal neck and arm openings, in place of the more usual vertical style typical to the well-known Peruvian poncho-like garments. Each of the small shirts consists of a single, uncut, rectangular cloth, roughly two and one-half times as long as wide, which has been formed into a tube with the warp running horizontally. In each case the fabric is plain weave, and of undyed cotton. The side selvages of the respective webs serve as finishes for the upper and lower edges of the garments. The upper edge of each tube has been sewed together at spaced intervals to form shoulder seams, the intervening unsewed spans providing a neck opening near the center and hand or arm apertures adjacent to the sides of the shirt, the sides being closed for their entire lengths.

These doll-size garments from Pachacamac (Fig. 1), now in the collection of the University Museum of the University of Pennsylvania, resemble in many respects a full-size shirt, from the La Capilla cemetery on the Hacienda Marques about 12 km. north of Lima, reported by Stumer and Gayton (1958). The chief differences appear in the greater breadth in proportion to height of the large garment and its two-web construction (Stumer and Gayton 1958: 182, Fig. 1). The length of one web equals the breadth of the large garment, in place of twice the breadth as in the small shirts (Fig. 2).

One of the three miniature specimens (Fig. 1 *a*, UMUP No. 30731, Uhle Cat. No. 1093 *b*) has been fashioned in a manner closely akin to that described for the Marques shirt. It varies in having only one side seam where the end selvages of the cloth have been joined (Fig. 2 *a*). Since it is constructed of a single web, a fold replaces the second side seam present in the large example. A like method of folding a web to form one side of a shirt and sewing the ends of the fabric together at the opposite side of the garment, appears in another shirt reported by Gayton (1955: 263–70). This example, from Piedras Gordas, 6 km. south of Ancón, now in the collection of the University of New Mexico (Loan No. UNM F 15–93), also includes the use of horizontal neck and arm openings, but the general style differs markedly from that of the miniatures. It is made up of three long narrow webs used horizontally one above the other. The upper one is longer than the others, extending beyond the lower two at each side of the garment to form sleeves with the hand openings along the lower edge of the top web (Gayton 1955: 265, Fig. 77 right).

This miniature (Fig. 1 *a*), which is brown and white and the smallest of the three Pachacamac specimens, averages 4¾ inches long (the fabric breadth) by 5⅛ inches wide (half the warp length). Considerable dimensional deviation is present. The neck opening measures 1⅞ inches; the armhole adjacent to the folded side, ¾ inch; that next to the sewed side, 1¼ inches. Each of the shoulder seams is ¾ inch in length; an additional ¼ inch has been sewed into the side seam on the one side where a seam is present.

Coarse whipping stitches, ¼ inch deep and approximately the same distance apart, have been used for sewing the seams. Three long running stitches, which pass through one layer of fabric only, cross the space left open to provide an armhole between the ending of the whipping stitches of the side seam and the beginning of those of the shoulder seam, thus carrying the sewing thread from one set of whipping stitches to the next. Similar running stitches span the neck opening. This sewing has been done with a continuous coarse brown yarn, about ⅛ inch in diameter, with a medium to hard twist (Osborne and Osborne 1954: 1097). The direction of the spinning appears as Z-S-S, single-ply yarns being doubled and twisted, then redoubled and twisted in a like direction. Apparently the sewing stitches of the remaining shoulder seam loosened at some time in the past and were replaced with a different yarn which was tied to the end of the original brown sewing thread at the neck edge. The second shoulder seam is now sewed with this replacement yarn, which is white and finer than the brown. It

has been spun in a like manner, except that in this case the degree of twist in the respinning is very soft.

The warp yarn used in the weaving is single-ply, crepe-twist, with considerable dimensional variation within each yarn, producing in some areas the effect of modern slubbed yarns. The average diameter is about 1/32 inch. All of the yarns are of undyed cotton, Z-spun. The warps of approximately two-fifths of the web, a span of about 2 inches along one side of the cloth, are of a natural brown hue (Maerz and Paul 1950, Pl. 15–C–11), while the remainder are cream-white (Maerz and Paul 1950, Pl. 9–B–2). In a few instances brown and white fibers have been mixed prior to or during the spinning. Irregularities in spinning appear to be somewhat greater in the light-colored yarns than in the brown, otherwise the only distinction between the two is in the coloring. The weft yarn is like that of the warp, either brown or brown and white mixed. Through the central section of the cloth the wefts have been used singly, producing a simple one-over-one plain weave. At both ends of the web the wefts are in pairs. These double yarns are present for a length of about 2¾ inches from each end selvage. The warp count is 28 per inch for both the brown and white sections. The weft count is about 13 where the wefts are single, 11(2) where they are double, making the weaving of the end sections somewhat more compact than that of the center section, although, again, there is considerable variation. The preponderance of warps over wefts is clearly visible in the woven fabric, but the weft yarns are not concealed by the warps. This results in the fabric classification falling between the square count and the warp-face groups. The loomstrings consist of three yarns at each end of the web, but these are in only two picks in each case, a single heavy cord in the first, the other two together in the second pick. The solitary yarn is four-ply; those used in pairs are two-ply. All of the loomstring yarns appear to have been made by doubling and respinning the basic weaving yarns. All are of the same brown and white cottons. The diameters range from 1/24 to 1/16 inch.

Two decorative features are present in this specimen, but there is no distinguishing decorative patterning. A tweed-type fabric has resulted from the use of yarns composed of mixed brown and white fibers and of those with varying diameters, especially noticeable where the latter cross yarns of contrasting hue or value. The brown band, which extends yoke-like across the upper part of the shirt, has produced an interesting contrast with the

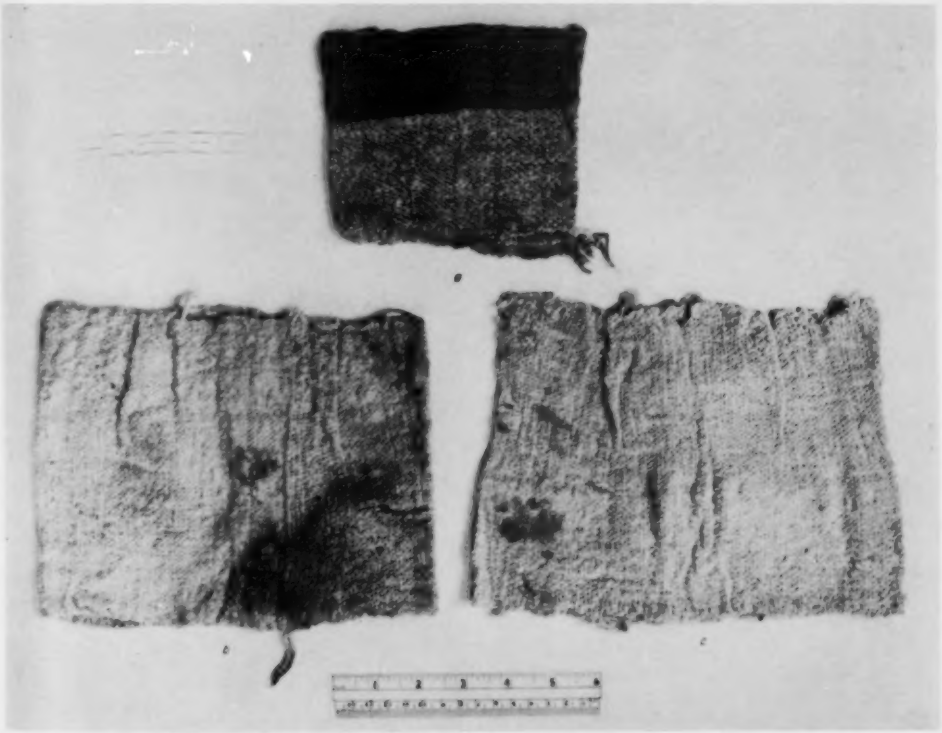

FIG. 1. Three miniature cotton shirts from beneath the Temple of Pachacamac, excavated by Max Uhle, 1896, showing horizontal position of warp yarns and of the neck and arm apertures. *a*, white with brown yoke-like band (UMUP 30731 [1093 *b*]); *b*, white, seamless, with pleats (UMUP 30707 [1090 *c*]); *c*, white, seamless, with pleats, also slight flare at lower edge (UMUP 30732 [1104 *l*]). Height of *a*, 4¾ inches.

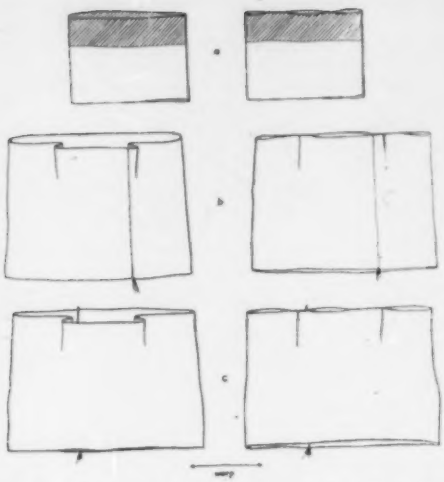

Fig. 2. Diagrams of the construction of the three shirts shown in Figure 1, indicating the location of the sewing. *a*, shirt with single side seam (UMUP 30731 [1093 *b*]); *b*, seamless construction, showing position of common loomstring, also pleats (UMUP 30707 [1090 *c*]); *c*, similar to *b*, with variant location of loomstring and addition of flare at lower edge (UMUP 30732 [1104 *l*]).

lighter body of the garment. The sewing stitches, although large and conspicuous, cannot be classed as decorative. They are of the standard utilitarian types common to Peruvian sewing. The widths of the two ends of the fabric differ by ½ inch. Where they are joined this excess of the wider extends below the narrower, together with miscellaneous ends of sewing, weaving, and loomstring yarns. The yarns hang below the fabric for about ½ inch in an untidy fashion which cannot be construed as being ornamental.

The other two miniature shirts (Fig. 1 *b*, *c*) which are about alike in size and construction differ from the above in some respects. They are slightly larger, cream-white throughout, have seamless tubular construction and have front (?) pleats at the shoulder line (Fig. 2 *b*, *c*). The pleating is like that reported by Emery and King for two shirt fragments recovered near Huacho, about 130 km. north of Lima, and now in the collection of the United States National Museum (Emery and King Numbers 6 and 8 of USNM lot 383139, Emery and King 1957: 72). These fragments, presumably, were parts of full size garments which, in addition to the pleats, show resemblance to the little shirts in the horizontal position of the warps and of the neck openings, and to the smaller of the shirts in the yoke-like position of the decorative bands. In other details these large shirts, including also a third specimen (No. 10) which has two pleats at each side in place of one (Emery and King 1957: 72, 73, Figs. 1, 2), are distinctly different from the miniatures, being closely akin to the three-web shirt from Piedras Gordas reported by Gayton (1955).

One of the small white shirts (UMUP No. 30707, Uhle Cat. No. 1090 *c*) has a height of 7 inches from the lower edge to the shoulder line, and a side-to-side breadth of 9¼ inches. The former measurement represents the woven width of the fabric; the latter, half the warp length. The construction of this garment differs somewhat from the preceding, as noted above. There is no side seam. The fabric forms a continuous tube and was either ring or circular woven (O'Neale 1949: 110, Fig. 29 *c*) or was joined by means of a pair of heavy yarns threaded, alternately through the warp loops of the two ends of the fabric (Fig. 3). In addition, a small pleat, about ½ inch deep at the top, has been folded on each side of the center. These two pleats have been turned in opposite directions and are held in place only by the shoulder seams (Fig. 2 *c*). There is a 3-inch neck opening at the central part of the upper edge, and ⅞-inch unsewed spaces have been left adjacent to each side to accommodate the arms or hands. The intervening 2⅛-inch shoulder sections have been seamed with coarse whipping stitches, each about ⅛ inch deep and ¼ inch apart. The sewing yarn is coarse, 2-ply, cream-white cotton, S-Z spun. The yarn diameter about 1/16 inch; the degree of twist, medium. The sewing does not continue in running stitches across the openings as in the other example. The yarns have been severed but not fastened securely, the terminal ends, ½ to 1 inch long, hang free. The side selvages form the edge finishes for both the bottom of the garment and the openings along the upper edge. There are no vertical openings.

The fabric is monochrome, the yarn all cream-white cotton (Maerz and Paul 1950, Pl. 11–B–2). Both warp and weft are of single-ply, S-spun, crepe-twist yarns. The diameter of the warp is about 1/32 inch, that of the weft averages 1/24 inch. The warp count is 24 per inch, that of the weft varies from 13 to 17 per inch in adjacent areas. These differences in count compensate to a large extent for the variations in weft thickness, so that little change in the compactness of the weaving is noticeable for the major part of the web. Although the fabric is smoother in appearance than that of the preceding example, variations in yarn diameters are quite marked, especially in the weft. The contrast is conspicuous in the areas adjacent to the line where the warp loops meet (Fig. 3), and is further pointed up by the location of this line close to one of the pleats, presumably in the front of the shirt (Fig. 2 *b*). Despite its prominence, it seems unlikely that this contrast was intended to be decorative. There are a few places where the weft yarns appear to have been spliced or reinforced in a manner which makes them two-ply for short distances. In the latter respect the method differs slightly from that shown by Bird and Bellinger (1954: 106, Fig. 19, Pl. 124). Elsewhere in the weft, yarn joinings have been made by the familiar method of turning back the weft ends into succeeding picks for a distance of about an inch from the selvage.

As noted above, only one loomstring consisting of a pair of yarns is present. This, which consists of two two-ply yarns like those used for the sewing, appears in the

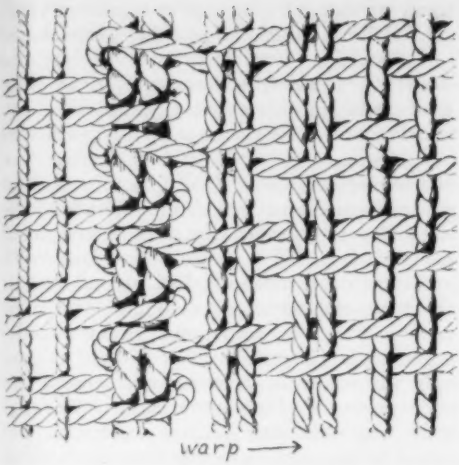

FIG. 3. Diagram of the detail of the joining of a seamless web (UMUP 30707 [1090 *c*]) showing warp loops, the common loomstring and the adjacent weft yarns.

shirt as a heavy lengthwise rib, and the yarn ends hang below the lower edge of the garment for about 1½ inches. The individual warps loop over this cord from two directions, alternately. In the two adjoining picks on one side of the loomstring, the weaving yarns have been inserted in pairs (Fig. 3). Adjacent to these the coarser weft yarns have been used for 1¼ inches. Following this there is a single pick in which the weaving yarns have again been doubled. On the opposite side of the loomstring is a span of about 1¾ inches of finer weaving. The remainder of the web shows little texture differentiation, although there is a certain tapering off or gradual change over rather than a rigid line of demarcation between the finer and coarser areas, except at the loomstring. It seems probable that the pair of doubled yarns serving as a heading for one end of the weaving, mark a point at which the weaving was commenced, and that, following this start, weaving progressed from the opposite side of the loomstring, being finished off where the coarser yarns appear in the 1¼-inch space between the single pick having paired wefts and the two which serve as a heading.

The second of the little white shirts (UMUP No. 30732, Uhle Cat. No. 1104 *l*) follows the same basic plan of construction. It is 6¾ inches in height, 9½ inches from side to side. As with the preceding, there is no joining seam, the warp loops of the two ends of the weaving passing around a common loomstring. Two pleats have been folded in the front (?) of the garment, but these pleats have been placed about as far as possible from the loomstring and join, this thicker part of the web being fairly well centered in the back (?) of the shirt (Fig. 2 *c*). One pleat is still secured by the shoulder seaming; the second is no longer sewed, but the creases remain, clear and sharp. The sewing threads along the top edge are poorly preserved. The remaining bits of yarn indicate that whipping stitches were used and that one arm opening was approximately 1 inch in length, the other about ¾ inch. The neck aperture, which is intact and 1¾ inches across, is not centered between the pleats, which are equidistant from the sides. The indications are that one shoulder seam was about 1¾ inches in length, the other about 2¾ inches. Part of this upper edge of the shirt is in poor condition, the stitches and the fabric apparently having been pulled away from each other with sufficient force to tear the selvage. The sewing threads are tightly fastened at the ends of the neck opening and also at the margin of one arm aperture. At the other, they have been pulled loose, as have most of the intervening stitches. The thread ends have been severed close to the fastenings and there is no evidence that running stitches were present anywhere on the garment. The sewing thread duplicates that of the preceding example.

The fabric is all of cream-white cotton (Maerz and Paul 1950, Pl. 11–B–2). The yarns are like those of the other piece, except for the wefts and part of the warps being very slightly coarser. The warp count averages 22, the weft count 14 per inch. The area where the last weft yarns were inserted, in this case, is quite well defined, the wefts for a span of about 2 inches being both coarser and more widely spaced than those of the body of the fabric. The yarns in the picks immediately adjacent to the loomstring have been doubled. The loomstring consists of two two-ply yarns, Z-S spun, medium twist, about $\frac{1}{8}$ inch in diameter, used together in a single pick. The ends, about ½ inch long, hang free at the neck edge of the shirt. At the lower edge they have been tied to the ends of the pair of single-ply yarns forming one of the adjacent picks of the weft. The ends, including the knot, extend about 1¼ inches below the fabric edge.

One other oddity is present in the weaving. The warp yarns of one side of the web, the lower 3 inches of the garment, are coarser than the others, producing a slight flare and stiffness in the lower part of the shirt. This, together with the pleats, gives the garment the appearance of having been shaped, a result which may or may not have been intentional. Except for the pleats and this additional "shaping," the white shirts display no decorative elements.

Attempts to determine the exact locale from which these miniatures were recovered and to place them in a time and style sequence are not very fruitful. The three specimens are all entered in the field catalogue under the heading "Continuation of the excavation of Pachacamac. Excavations some 10 meters to the west of the foregoing ones, at the foot of the old half-terrace" (Uhle 1896: 20, Vol. 3, Pt. 1, Sec. 2), the "foregoing" being described as a "Continuation of the Collections from Pachacamac, on the Foot of the Temple of Pachacamac" (Uhle 1896: 1, Vol. 3, Pt. 1, Sec. 2). According to Uhle's diagrams of the site (1903: 19, 20, Figs. 3–5) and his descriptions of his excavations (1896: 35–48, Vol. 2, Sec. 2), these excavations were in the vicinity of the terraces marked *o*, *p*, *q*, whether from the "grave soil," the burials in the "new soil," or from the "original burial ground" which extended under the newer

temple as far as the wall of the old temple (Strong, Willey, and Corbett 1943: 35, Fig. 2) cannot be determined. No more specific information has been provided. A few clues, but no definite conclusions, can be drawn from other catalogue entries in related categories.

One additional miniature poncho is listed under the same subheading as the above, "some 10 meters to the west of the foregoing ones." The warp has been placed vertically in this specimen (UMUP 30727; Uhle 1122 *n*) and it has the common type of vertical neck and arm apertures. It is of undyed, light brown cotton in a loosely woven plain-weave (count, 34 by 16 per inch). The yarn is all single-ply, crepe twist, about 1/48 inch in diameter but having considerable dimensional variation. A kelim (slit tapestry) slot provides the neck opening. The single four-selvage web, woven 15 by 7¼ inches, has been folded in half along the shoulder line. The usual whipping stitches close the side seams below unsewed spaces left for the arms. This shirt is neater in appearance than are the three with horizontal neck openings. A note in the field catalogue, questioned because of an inconsistency in the number sequence, identifies this as from a mummy (Uhle No. 971) in a very deep grave (Uhle 1896: 8, Vol. 3, Pt. 1, Sec. 2), the same in which two ceramic cat figures were found which Uhle classed as early Epigonal (1903: 27–8, Pl. 5, 6*a*, 6*b*). Since the listing for this mummy falls in the same main category but not within the sub-section "10 meters to the west," and the number sequence fails to correspond (a criterion which Uhle himself used to place items separated from their companion pieces during packing and shipping), it seems likely that this entry is in error, the inference being that this, together with the other miniature shirts, was found 10 meters to the west of the very deep grave where mummy No. 971 (Skull P 40) was recovered.

Frequently those items bearing a like field catalogue number, where letters have been used to distinguish the individual items, constitute an associated group. In this case the group numbers, 1090, 1093, 1104, are of little value. The 1090's consist of a heterogeneous collection of textiles. Some of these are listed as from the disturbed soil (Desmonte) which would eliminate the probability of their having been recovered from a single burial. All are classed merely as "remnants of fabrics" (Uhle 1896: 21, Vol. 3, Pt. 1, Sec. 2), 1090 *c* being the only small poncho. One large shirt is present (1090 *g*, UMUP No. 30293). It is of sheer, unbleached cream-white cotton fabric, made of very fine single-ply, crepe-twist yarns, woven in plain weave, without decoration. Constructed of two breadths of cloth with the warp used vertically, the shirt has the common style of vertical neck and arm openings, and small, short, rectangular sleeves have been sewed to the armholes. The size and proportions of this garment (height 22 inches; breadth 37¾ inches; sleeve length 2¾ inches, circumference about 6 inches) suggest that it was made to clothe a mummy pack. The variety of fabrics within the group includes coarse and fine plain weaves without decoration, plain weaves in stripes and plaids, and plain weaves combined with pattern weaves of both warp and weft varieties; also, fine and coarse kelim (slit) tapestries and one embroidery. Other than stripes, the designs are chiefly variations of interlocking patterns, but there is nothing sufficiently distinctive to indicate a particular period affiliation. The same is true of the color combinations.

The 1093's carry no group designation. Of the four items, one is from the disturbed soil. The small poncho is the only fabric (Uhle, 1896: 22, Vol. 3, Pt. 1, Sec. 2).

The 1104's include several textiles, but only the one shirt. The other textile items are not immediately available for study. These artifacts are described as "Found with a mummy, which was in a rotten condition." Listed immediately following this entry in the catalogue (preceding 1105) are two skulls (Nos. 61, 62) described as "deformed broadwise" which were "not found very deep below the surface" (Uhle 1896: 23, Vol. 3, Pt. 1, Sec. 2). These skulls are further identified as "broad and strong" (Uhle 1896: 3, Vol. 1, Sec. 1) and as coming from the "Pachacamac, first Cemetery at the Foot of the Temple of Pachacamac" (Uhle 1896: 1, Vol. 1, Sec. 1). Although Uhle generally has identified the mummies in terms of skull numbers, the relationship between the two skulls and the one disintegrated mummy is not apparent, nor is it clear from the description whether or not Uhle considered these to be of the common Coastal occipitally flattened type (Uhle 1896: 16; Strong, Willey, and Corbett 1943: 34). Some confusion also is caused by the terms *First Cemetery*, *Cemetery I* and *Gravefield I*, being used variously to include the whole of the area beneath, at the foot of, and surrounding the

Temple of Pachacamac, or to designate any part where burials were found under or within the environs of the Temple.

No further explanation or description of the items considered above seems to have been provided. Neither the small shirts nor the other artifacts of corresponding stem numbers have been mentioned in Uhle's published account of the excavations (Uhle 1903), or if so, have not been identified by number or so described as to be recognizable. Further difficulties are met in attempts to classify these miniature garments, since all are without decorative patterning and Uhle's interest centered primarily on the designs (Uhle 1903: 22). Uhle did give considerable attention to the detail of design producing techniques and occasionally mentioned the color or texture of undecorated fabrics and the styles of various garments, for example, he has classed all of the ponchos from "a second stratum of new soil in front of the Temple" as "long and close-fitting" (Uhle 1903: 37) in contrast to the short, broad type found elsewhere. Although he made no mention in his text of shirts with horizontal neck and arm openings, it is obvious from his catalogue listings that he recognized this method of shirt construction.

A few of Uhle's general conclusions apply to the materials under consideration. Uhle believed that the tendency for skull deformations to be of the common coastal types indicated that a limited "variety of provincial types" were present and that differences in the graves and their contents would therefore represent temporal or period variation (Uhle 1903: 16). He considered all of the area under the terraces of the Temple of Pachacamac to have been "covered at some early pre-Spanish time" (Uhle 1903: 19), and he wrote in his original report that "No objects whatever of the Incaic period were found in the graves beneath the temple terraces, nor in the whole of the cemetery which surrounds the temple" (Uhle 1896: 43, Vol. 2, Sec. 2). In his published report he mentions the presence of a few Inca graves (Uhle 1903: 18); presumably these were not beneath the terraces (Uhle 1903: 21). He concluded that most of the artifacts from the excavations beneath the temple were of a post-Tiahuanaco "Epigonal" style, as defined in his 1903 publication. Later, Uhle (1908) revised his classification placing some of the early Epigonal group in a pre-Tiahuanaco sequence. This later interpretation tends to be confirmed by the conclusions of Strong and Corbett (Strong, Willey, and Corbett 1943: 34–6) who have made more recent (1941) studies and excavations at Pachacamac.

Judging from Uhle's explanations and descriptions it seems improbable that these well-preserved miniature shirts with horizontal neck and arm openings belonged among the "oldest" of the fabrics excavated by him, since he has mentioned the scarcity and poor condition of the textiles of this group (Uhle 1903: 22, 29). Their exclusion from the contents of the "graves found in the new soil" is also indicated, due to the scarcity of textiles found and the variant descriptions of the few fabrics so classified (Uhle 1903: 35). If these judgments are correct, the shirts were not Inca and were among neither those finds which Uhle (1903: Pls. 7, Figs. 1–9, 8) considered to be of the Late pre-Inca style, nor those of the Tihuanaco style (1903: Pl. 4). This would place them in the "style of the Epigone Period" (1903: Pls. 5, 6) as defined in Uhle's 1903 publication, a term which now appears to apply to several styles and a considerable time span (Strong, Willey, and Corbett 1943: 36).

All of the large shirts with horizontal neck and arm openings, which have been cited, as well as the three small ones, came from the same general coastal area, with only the miniatures from Pachacamac. The various large shirts have been classed as "late" (Emery and King 1957: 72), "just pre-Inca or early Inca" (Gayton 1955: 270) and "Late Tiahuanacoid III or very early Chancay" (Stumer and Gayton 1958: 181). The miniatures show their closest affiliations with the latter, both in respect to garment style and provenience. Present evidence indicates that the use of pleats and of the yoke-like bands in these miniatures pre-dated their similar use in the large shirts, which, although having horizontal neck and arm apertures, are of a more complex style and appear to belong in a distinct category.

It may be inferred from a study of these three miniature garments that no great care was taken with their construction. While they lack the characteristics of beginners' weaving, they do not show a high quality of workmanship. The surety with which the construction seems to have proceeded indicates the work of an experienced hand and a well established pattern, rather than experimentation or the handling of an unfamiliar plan. The one shirt made of a single web folded and sewed together at the

ends, might be construed as being a substitute for the two-web style, thus representing merely an expedient way to make a small size garment. This is belied to some extent by the use of three webs similarly folded in a full size garment (Gayton 1955), and also by the construction of the two small examples, which were tubular-woven or joined without seaming. It is confirmed in a limited degree by a doll dress from Quiché (UCMA Spec. No. 4–4116) which was put together along the same general lines, but made of a cut down cloth. This, reported by O'Neale and others (1949: 146, Pl. 1), lacks arm openings but presumably has the horizontal neck opening. No data concerning the warp direction or the presence or absence of seaming have been included in the description. A shirt found on another type of small doll-like figure attached to a mummy bundle (Bennett 1935: 69 lower center; also, Bennett 1946, Pl. 53; Steward and Faron 1959: 97) appears to be similar and to have both neck and arm apertures along the horizontal upper edge. This, for which no description is given, is listed as from Trujillo (Steward and Faron 1959: 97). The possibility should be noted that the two latter examples, for which descriptions are lacking, may not be removable garments but merely wrappings sewed together at the back of the figure, such as those from Cajamarquilla described by Mahler (Lothrop, Foshag and Mahler 1957: 30–1, Pl. 17). Whether the Pachacamac miniatures were made as doll clothes, coverings for figurines which were not toys, or as token apparel for the dead, is not indicated. These garments have been made sturdy enough to withstand considerable use, and the fabrics and sewing are both of utilitarian types. Each has been designated in Uhle's field catalogue simply as a *Minaturponcho*, "miniature poncho."

In conclusion it may be noted that a comparison of these miniature garments with their nearest counterparts shows no new features but reveals the presence of several items of rare occurrence and a number of interesting innovations in their use.

The horizontal neck and arm openings, the pleats and yoke-like warp bands, all reported in a small number of large garments, not only appear in miniature but have been recombined. The pleats and yoke-effect have been used separately, instead of together as in the large shirts, and each has been combined with the type of simple horizontal neck and arm apertures which have been reported for a single large shirt which lacks both the pleats and the yoke-effect.

Neither ring weaving nor the joining of the two ends of a web by means of a common yarn or yarns threaded through opposing alternate warp loops have been reported as a means used for closing a shirt side "seam," although both processes are known to occur in Peruvian weavings. Similarly, single-web garment construction is common, as is the folding of a cloth along the shoulder line to form the back and front sections of a shirt; but the folding of one or more webs at the side to provide the back and front of a shirt is unusual, and a single web used for making a shirt in this fashion seems not to have been reported. The placing of neck and arm openings parallel to the warp and the providing of these openings by leaving unsewed spaces along the selvages are standard Peruvian procedures which have been retained in these miniature shirts, as has the use of a weftwise fold. However, the horizontal placement of the warp has reversed the positions of these features and has called for a redesigning of the garments. The workmanship indicates that this redesigning did not take place in the making of these particular shirts, but was already part of an established pattern of which there were two accepted variations.

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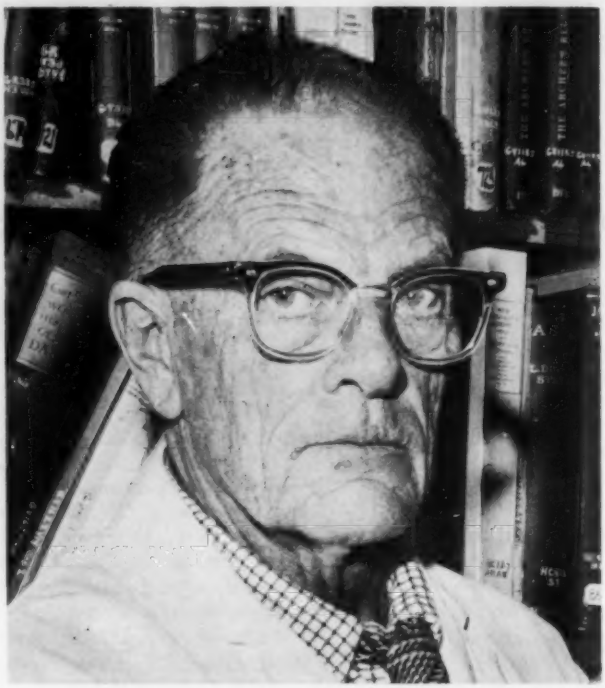
Florida State University
Tallahassee, Fla.
August, 1960



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MALCOLM JENNINGS ROGERS

1890–1960

Southwestern archaeology lost one of its pioneers when Malcolm Rogers' jeep was struck from the rear on September 11, 1960. The injuries sustained resulted in his death in San Diego on September 14, only days after he had completed a manuscript embodying some of the conclusions he had reached as a result of study which extended back to 1919. During a period when anthropological research in the desert portion of the Greater Southwest was concentrated on social anthropology he was virtually alone in giving attention to problems of archaeology, yet he still found time to collect ethnographic data on technology, ethnobotany, and mythology from surviving Indian groups in Southern California, Baja California, and Arizona which provided bases for his archaeological interpretations. It was foreseen that the ethnographic resources would shortly disappear; it was not foreseen that the archaeological resources also would vanish as quickly under the inroads of "collectors" and expanding settlement. The nature of the archaeological evidence in this area is such that it is more than usually vulnerable to this kind of destruction, so that archaeologists working in the area in the future will have less than the usual proportion of remains available, and their debt to Rogers will be that much larger.

That the debt will not be greater is a function of two dilemmas which Rogers was less successful than some in solving. He loathed administrative work, yet was

(Continued on next page)

forced by circumstance to play an administrator's role as well as that of a researcher which he so much preferred. Furthermore, he was committed almost to the point of obsession to the thesis that he should announce no conclusions (even in the form of hypotheses) until he had considered all the evidence. Consequently, he published only under pressure and always, as he felt, prematurely. That his reports so often present his formulations without detailing the evidence on which they are founded is a reflection of that approach, as well as of one of his characteristic "blind spots." He was perhaps overprone to assume knowledge on the part of others which, in his case, was a product of his own particular training and experience. That his concepts had empirical and theoretical foundations susceptible of communication to others has been demonstrated repeatedly in conversations when he was shown the necessity of explicating what he regarded as common knowledge. The background for his reports is further demonstrated in the superb volumes of field and laboratory notes which he left for the period from 1919 on.

The archaeology with which he dealt requires the particular preparation which Rogers brought to it — one is reminded of the relationship between training and career in the case of such men as Dubois and Black. Born September 7, 1890 in Fulton, New York, he attended public schools in Syracuse and Jenner's Preparatory School, and matriculated in science at Syracuse University, where he studied for six years, ultimately specializing in mining geology. At the same time his predisposition toward science was balanced by an informed taste in music and wide reading in literature, and as a youth he was a frequent visitor in the home of Raphael Pumpelly, whose talk did much to shape his life. During 1917–18 he worked as a mining geologist in the Pacific Northwest, returning to the east in 1918 for government service in connection with the galena shortage and enlisting in the Marine Corps later that year. After his discharge in 1919 he took up citrus farming at Escondido, California, and began the pursuit of those interests which soon led to his long association with the San Diego Museum of Man. At first this association was on a volunteer and part time basis — he appeared listed first as Field Archaeologist — but by 1930 when he moved to San Diego he had become a full time Curator. He served the Museum in both administrative and research capacities until the end of 1945, when he resigned and moved to Hipass, California, until poor health caused him to move to Scottsdale, Arizona. During this period he maintained his interest in archaeology almost in spite of himself. Improved health and pressure from friends persuaded him to return to the Museum as Research Associate in 1958 to undertake the task of preparing his work for publication and to assist in reorganizing the collections after the disturbances of the war years when the Museum had been taken over by the Navy.

Rogers' major contributions were the perceptions of culture differences and sequences in the desert Southwest and the southern coast as a function of human ecology in an arid habitat. He recognized and described the La Jollan complex on the coast and the widespread San Dieguito and Amargosa complexes of the interior. His excavation of a buried San Dieguito site confimed the sequence for that complex developed from his study of the surface alteration of stone artifacts and the relation between artifact types, their surface alteration, and their occurrence with respect to physiographic evidence. He went counter to the atomistic trend of reconstructing a different culture for each different projectile point found, seeing instead one underlying culture pattern of food collecting modified by local and regional variations as the product of the interplay between economy, technology, tradition, habitat, and population movements. This, together with his conservatism regarding the dating of Early Man remains in the area gave him a reputation for intransigence, yet it was his efforts to modify his hypotheses rather than disagree categorically with those of others drawn from a lesser range and body of evidence than used by him that, in my opinion, made his reports difficult to use. I like to remember him as I saw him one afternoon afer his return to the Museum of Man in San Diego. Norman Tindale, of the South Australian Museum, had come down from UCLA to study archaeological collections from the arid Southwest, bringing with him slides of Australian artifacts, both ethnographic and archaeological, for comparison. Eventually it became apparent that some of our assumptions are ill founded, and Malcolm looked up and said, "It looks as if we will have to change our ideas."

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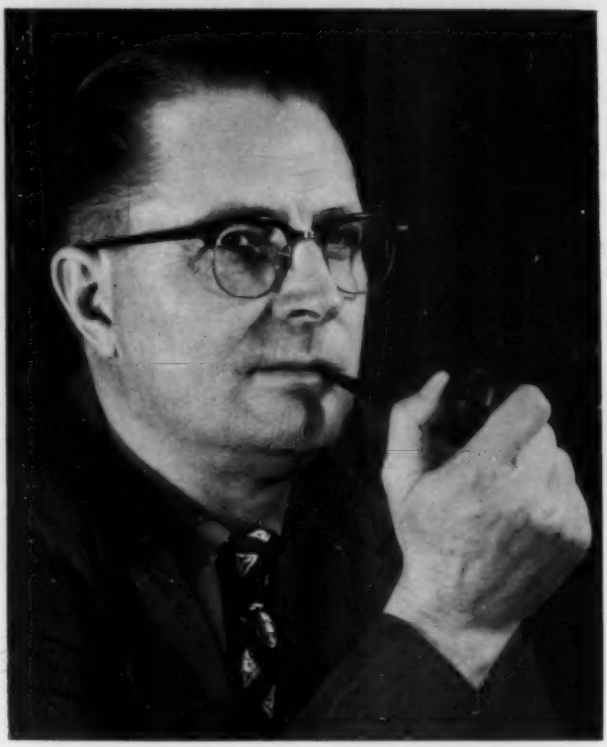

ELMER RICHARD SMITH

1909–1960

In 1950 Elmer R. Smith wrote a history of Utah anthropology, in which he charted the cycles of surge and ebb that began with Byron Cummings' pioneer work in 1895. The interesting thing about this history was that Smith had been a part of all the cycles, except this earliest one with Cummings. Following Cummings at Utah such men as Neil Judd, Andrew Kerr, Julian Steward, and John Gillin, did outstanding research in both archaeology and ethnology. Elmer Smith was a product of the teachings and influence of all these men. As a boy he had met Judd; as a young man and a student he worked with Kerr, Steward, and Gillin. With this training and stimulation, plus his own vitality and zest for life—and enthusiasm for anthropology, which for him was a complete intellectual and emotional fulfillment — it is no wonder that he contributed significantly, personally, to the progress of anthropology in the West.

Aside from developing ethnological interests, Smith conducted an archaeological survey over most of western and southern Utah during the 1930's. As early as 1934 he excavated the now well-known Shonesburg ruin in Zion National Park.

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Later his excellent work at Deadman's Cave near Magna, Utah, established a valid sequence of desert-culture artifact forms which has been a guide to subsequent work. He also correctly correlated the Cave's history with a late still-stand of Lake Bonneville. Later, in 1940 and 1941, he located and sampled many of the ancient caves near Wendover which were later studied by others at the University of Utah.

All during this period of archaeological field work and research, which he enjoyed tremendously, he also taught heavy loads in both sociology and anthropology. In fact, he was first and last the teacher. In his 23 years at the University of Utah he passed on to thousands of students his enthusiasm, which bordered at times upon the evangelical, for anthropology and the insights it held for young Utahns. For the past six or eight years his classes have been filled with the children of his earlier students. He was not a Mormon; he was an outspoken critic of the philosophy of the Church of Jesus Christ of Latter-day Saints, because many LDS beliefs seemed to him to run counter to scientific anthropological findings.

Most of his students know him not at all as an archaeologist, although he had done much archaeological work and had started the archaeological careers of such students as Arden King, Carling Malouf, and William Mulloy. Most knew him as an arch-champion of minority groups. This interest grew out of service as a community analyst, beginning in 1944, with the War Relocation Authority in Idaho. As a result of this service, he has been identified for the past fifteen years with problems in race relations, interdisciplinary projects, and applied anthropology. He was respected and valued by the university community as a courageous, inspirational teacher. Although born in Idaho (St. Anthony, January 28, 1909), Smith was educated at the University of Utah, receiving his B.Sc. in 1931 and the M.Sc. in 1932. He later did graduate study at the University of California in 1937, and the University of Washington in 1946 and 1948, but at neither place did he take a degree. During his life he collected an enormous personal library in the social sciences; furthermore, he had read and understood these volumes.

Smith's bibliography is recorded in the *American Anthropologist*, Volume 62, Number 6, pages 1048–9, 1960. There should be added: "A Brief Description of an Indian Ruin Near Shonesburg, Utah," *Zion and Brice Nature Notes*, Volume 6, Number 1, 1934. This article was subsequently reprinted as *University of Utah Anthropological Papers*, Number 4, 1950.

Smith's sudden death in May, 1960, while serving as Visiting Professor at the University of Montana, has closed another era in the history of anthropology in Utah.

JESSE D. JENNINGS

VIKING FUND MEDALS AND AWARDS

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Lothrop has probably published more major works of highest quality than any other Americanist. They range from Guatemala to Argentina and include valuable ethnological papers dealing with Guatemala and Tierra del Fuego. In these works, he has set high standards of ethnohistorical research and of scholarly presentation. His monograph on Coclé (Panama), in particular, stands out as a monument of careful excavation and accurate reporting. The full value of Lothrop's research is appreciated only by those who have followed him in the various areas of his activities. His work in Mesoamerica is basic to a proper understanding of the cultures of the area and has laid the groundwork for much of the recent change in the concept of the Maya. His reports on Costa Rica and Panama provide the essential foundation for all investigations in Central America and his monograph on the metal work from the *cenote* at Chichén Itzá is an outstanding publication. In his broad knowledge of Latin American studies, he has no peer.

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FACTS AND COMMENTS

THE RELATIVE VALUE OF FRAGMENTARY MAMMALIAN REMAINS

S. J. Olsen

Abstract

The diagnostic value of animal remains from archaeological sites is discussed in the following order of importance of the various osteological elements which can be used for interpreting the fauna they represent: teeth, skull fragments, articular ends of limb bones, foot bones, portions of the pectoral and pelvic girdles, and vertebrae.

SEVERAL DECADES AGO it was the rule rather than the exception to collect and save only the skulls, jaws, and more complete bones of animals that were found during the excavation of archaeological sites. In more recent years, the trend has been toward the preservation of all particles regardless of how fragmentary these scraps may be. This latter practice can present an almost overwhelming problem to the workers whose lot it is to interpret these remains. This is especially true when these assemblages of bones are composed for the most part of splinters from the ribs and the medial portions of the long bones of animals. It is true that very little is needed in some instances to pin down or identify the fragments in question (for example, certain areas of the shaft of an artiodactyl tibia), but in the vast majority of the cases encountered these fragmentary splinters will end up in trays of miscellaneous elements whose positive identification will always remain uncertain.

What, then, is of importance for use in identification and interpretation? The knowledge for the following discussion of the relative importance of fragmentary mammalian remains has been gained not only from experience with animal remains from archaeological sites, but also from associations with fragmentary fossil skeletons from various groups of Tertiary mammals.

Disregarding the rarely found articulated skeletons or complete skulls and jaws with dentitions intact, the elements that head the list of "what to save" are most surely any teeth regardless of whether they are incomplete or framentary. It is possible to establish the identity of a horse from less than a quarter of the grinding surface of a molar tooth. This last statement applies as well to many other groups of animals which have specialized teeth that are suited to the animal's particular needs and can be identified as belonging to a certain form. Under the average natural conditions of burial, the enamel of teeth will survive the ravages of time which destroy much of the remainder of the animal's skeleton and hence the teeth are more often preserved and found than are the isolated post-cranial elements. Much of mammalian classification is based on dental characters. This is only logical since the form and structure of the teeth indicate the diet and, to some extent, the habits of the animal to which they belong. Molar teeth are generally the more specialized and, therefore, as isolated teeth, the more important in establishing the identity of the animal that they represent. When found separately, premolars are next in importance with canines and incisors being the least important diagnostically. There are, of course, occasional exceptions to this latter statement, as with the canines of the saber-tooth cat or the incisors of proboscideans. Positions of the teeth, relative to one another, are most important in separating some closely related forms and it is worth the extra time and effort to preserve any dental series that appear to be in a natural position in the matrix, even though the bone surrounding the teeth may be extremely rotted or entirely missing. In many of the smaller mammals a single tooth will prove the identity of the animal in question as surely as a more complete skeleton. This is particularly true of most rodents and insectivores and many of the carnivores.

Skull fragments, no matter how small, should always be saved as very little in the way of preserved foramina, sutures or processes may separate out individual animals. Seemingly insignificant pieces of skulls which have even the scantiest portion of a horn core present will aid in establishing the presence of certain artiodactyls as being on the site under study. As with the skull, a small bit of a mandible can be as informative as can a more complete specimen. For example, the inflected angle of the lower jaw of the opossum or the double or premasseteric fossa of the extinct cave bear are two key characters that can be preserved on bone fragments of only a few square millimeters in area. It is nearly always possible to identify to genus and, many times, to species from very little in the way of skull, jaws, or incomplete dentitions.

The limb bones of mammals are distinguished largely by the shape and contours of their articulations so that terminal ends of these bones, whether they be the broken ends of adult bones or the epiphyses of immature bones, should be saved. Most limb bones will enable the person working with them to establish identifications on a generic level, at least. With the fragmentary larger limb bones such as the femur or humerus, it is not always possible to determine the animal beyond the family category but certain muscle scars, if preserved, or the presence or absence of such a character as the entepicondylar foramen of the humerus will narrow down the search and sometimes allow a more positive identification. The same is true for that small portion of the shaft of the radius that will show whether or not the ulna was fused with its shaft or was a separate and free element. In some instances, involving the larger Pleistocene mammals, fragments of the shafts of the humerus and femur are nearly useless and about all that can be determined from them is that a large proboscidean (?) or edentate (?) was present at the locality. For the most part, these generally numerous and shapeless splinters are not worth collecting.

Foot bones, whether they be carpals, tarsals or the distal extremities, are commonly well preserved and are usually diagnostic in shape. Even such seemingly insignificant appearing elements as the middle and distal pha-

langes of a felid can be assigned with some certainty to this group of carnivores when the recess is noted on the shaft of the first mentioned bone and the angle of the subungual process is present on the latter. Both of these features are present to facilitate entry of the ungual phalanx during the process of retracting the claws, a characteristic feature of the feet of cats. Little need be said concerning the terminal "hoof" bones of *Bos*, *Bison*, and

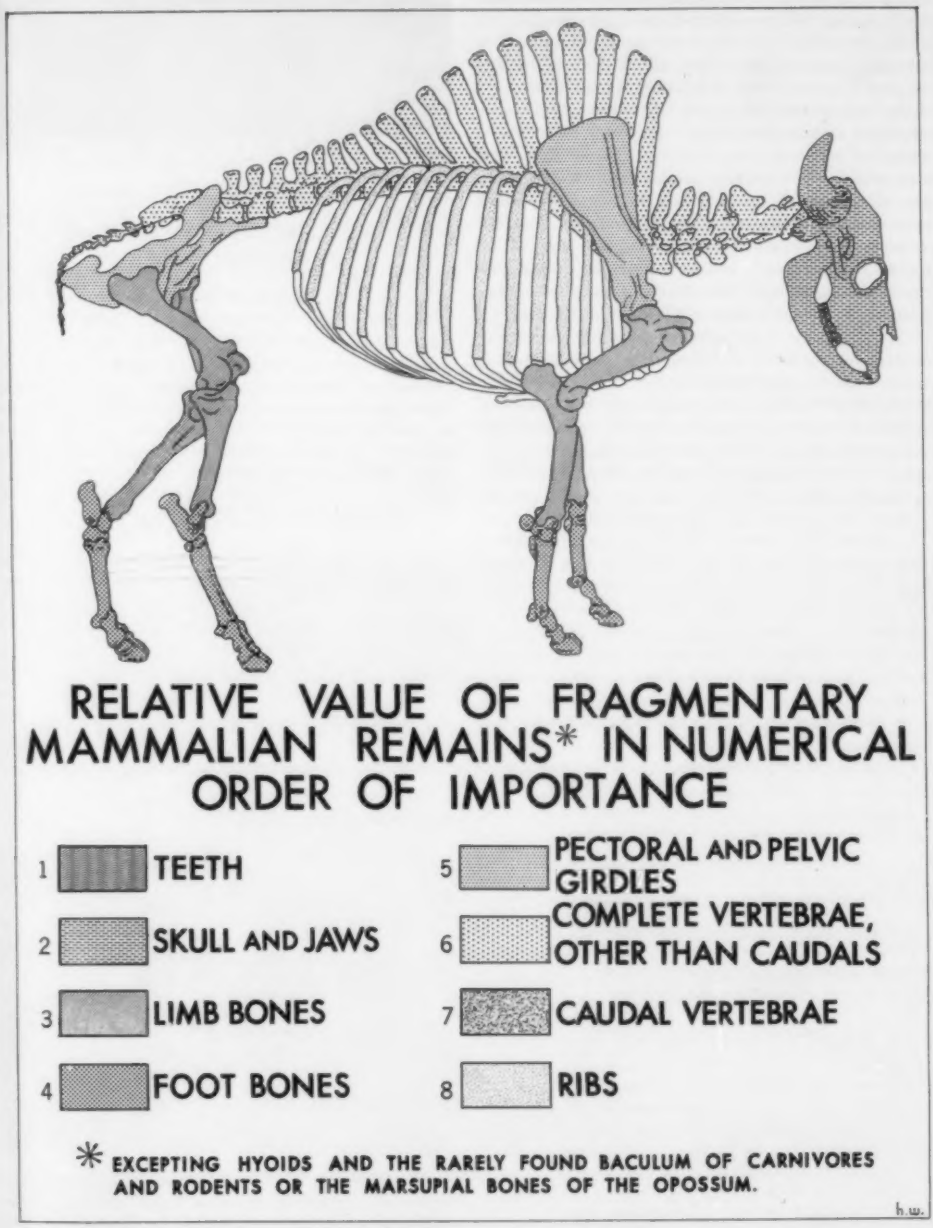
RELATIVE VALUE OF FRAGMENTARY MAMMALIAN REMAINS* IN NUMERICAL ORDER OF IMPORTANCE
1 TEETH
2 SKULL AND JAWS
3 LIMB BONES
4 FOOT BONES
5 PECTORAL AND PELVIC GIRDLES
6 COMPLETE VERTEBRAE, OTHER THAN CAUDALS
7 CAUDAL VERTEBRAE
8 RIBS
* EXCEPTING HYOIDS AND THE RARELY FOUND BACULUM OF CARNIVORES AND RODENTS OR THE MARSUPIAL BONES OF THE OPOSSUM.
h.w.

FIG. 1 [OLSEN]. Schematic representation of the relative value of fragmentary mammalian remains.

Equus, or for that matter any of the other forms that can be keyed out and separated from the other mammals by these elements alone. Certainly a family classification can be arrived at from very little in the way of foot material.

The pectoral and pelvic girdles are usually a bit other than complete by the time they are encountered in the quarry or site, but, as in the case of the limb bones, much information can be gained from very little in the way of articular surfaces or muscle scars. Actual size and shape of the innominate will narrow down the groups to be compared, and usually a family or generic level can be arrived at with incomplete pelvic material. The same holds true for the scapula of many animals but with this element it is possible to find features that will indicate more of the animal's habits than is possible from the pelvic girdle. For example, the postscapular fossa of the scapula will separate out this bone from similar-sized scapulae as belonging to bear. The comparative measurements of width and length of the scapular blade of the *Bison* will separate it from that of domestic cattle. Since the form of the bony elements of the shoulder girdle permanently record the function that they served during the life of the animal, it is possible with little effort to establish if the animal was a digger or a runner and hence, with many of the smaller mammals, which groups to turn to for comparative materials. Many forms have specialized scapulae which will enable a generic or even a specific identification from the scapula alone.

Vertebrae other than the caudals can be assigned to a family in the majority of instances. This is due in part to the same reasons given for the scapulae of mammals. The back muscles determine the animal's actions and these muscles in turn leave a record of their actions on the various processes of the vertebrae to which they were attached. A cat vertebra will indicate the lithe springing action of this animal, while the large neural spines present in the buffalo will indicate the heavy, powerful, low-hanging head of this familiar animal.

Caudal vertebrae and fragmentary ribs are last on the list of material to be salvaged from an archaeological site. In many instances, it is difficult even to assign these bones to a family or with rib fragments to do more than state that an animal the size of a horse or tapir was present.

The relative importance of these various fragmentary mammalian bones are illustrated and listed numerically in Figure 1. It is safe to say that representative elements of the first six listed categories should always be kept. However, the numerous fragments of shafts of limb bones having no articular surfaces or sculpturing should be discarded on the site. The same is true for broken vertebrae or ribs which cannot be assembled into more complete specimens.

It is far better to arrive at a general identification on the family level when this identification is made from poor or scanty material than to attach a label listing a specific determination when this species was "guessed at."

FLORIDA GEOLOGICAL SURVEY
Tallahassee, Fla.
August, 1960

FIG. 1 [BONAVÍA]. General view of the ruins of Pañamarca, Peru.

A MOCHICA PAINTING AT PAÑAMARCA, PERU*

DUCCIO BONAVÍA

ABSTRACT

A polychrome mural in the upper portion of the temple pyramid at Pañamarca in the Nepeña valley depicts a religious procession before a sacrifice. The main figures are a priest followed by two assistants, three prisoners, and a guard. The mural contains several motifs new to Mochica painting. It is assigned to Larco's fourth phase of Mochica culture, but some elements suggest the possibility of a somewhat later placement.

THE TEMPLE PYRAMID of Pañamarca (Fig. 1) rises majestically above its surroundings in the Nepeña valley, a few kilometers from the coast and to the south of Chimbote. It is one of the southernmost Mochica sites of ancient Peru. Although this important archaeological center is famous for its unrivaled mural paintings, the scientific data about it are extremely scanty. Except for the work of Richard Schaedel (1951), there are only some incidental or scattered notes which are of little aid. Perhaps the most important of these is the drawing of

* The manuscript was translated from the Spanish by David H. Kelley, assisted by Erik K. Reed.

FIG. 2. [BONAVÍA]. Drawing showing the architectural situation in which the mural at Pañamarca was discovered, and the numbers assigned to the figures in the procession.

FIG. 3 [BONAVÍA]. Extended color reproduction of the Pañamarca mural by the staff of the Museo de Arqueología, Universidad de San Marcos, Lima. Photo Guillen.

the assemblage in Squier's monumental work (Squier 1877), but it serves only for comparative purposes.

In 1950 when Schaedel made his investigations, the number of paintings which had then been discovered was already considerable, but the majority of these are today destroyed or in process of destruction and it is for this reason that the data of the North American archaeologist are of such great importance. In 1958, Hans Horkheimer was informed that a new Mochica mural had been discovered in these same ruins. He and I were able to admire this find in the same year by accompanying Erik Reed on a trip to the site undertaken for UNESCO.

Thanks to the aid of the Museum of Archaeology of the National University of San Marcos and of the UNESCO mission in Peru, we were able to complete a study of this new mural during the same year, and to have Felix Gaycho, draftsman of the Museum, prepare a copy of it. Unpublished notices of the results of this work have been written for the UNESCO mission in Peru (Bonavía MSS 1958, 1959), and two accounts have been published (Bonavía 1959a, 1959b).

The new painting is located near the representation of the sea snail with some feline characteristics which was studied by Schaedel. However, the Schaedel painting is practically at ground level, whereas the present one is supported on the remains of an ancient floor, which is very high in relation to the actual floor of the construction, and which must have been part of one of the highest spots in Pañamarca. Because of lack of time, we concentrated exclusively on the new painting, ignoring completely the remainder of the structure, which had already been studied in detail by Schaedel.

This painting, like all Mochica paintings so far known, was laid out by incising the figures in the fresh plaster with a sharp-pointed instrument, and then painted by filling in the enclosed areas with various colors. As is usual in Mochica art all the figures are represented in profile, and in various sizes, first, because perspective was unknown, and second, in order to show the hierarchy of persons by differences in size.

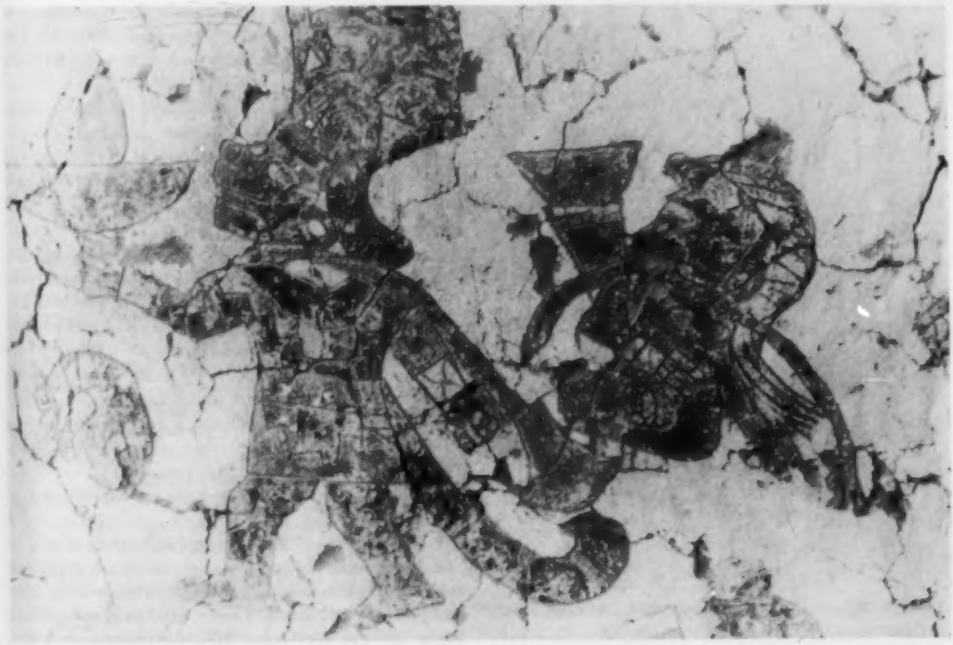

FIG. 4 [BONAVÍA]. Detail of the original mural painting at Pañamarca showing a snail-like creature (No. 2 in Fig. 2), a richly attired acolyte or attendant (No. 3 in Fig. 2), and a prisoner with a cord around his neck (No. 5 in Fig. 2).

The scene shows a procession moving from right to left (Figs. 2, 3). The first person (Fig. 2, No. 1) is of large size and richly attired. He carries in his hand what seems to be some sort of container, and is almost certainly a priest. He is followed by a very small creature (Fig. 2, No. 2) which is apparently a snail with a serpent head. Next are two well-dressed personages (Fig. 2, Nos. 3, 4), one above the other, who appear to be acolytes or assistants of the high priest. They also carry objects in their hands, the upper one a cup and the lower one an enigmatic implement. Then come three prisoners (Fig. 2, Nos. 5, 6, 8) represented in the classic Mochica manner, naked and with cords around their necks. They are guarded by another person (Fig. 2, No. 10), who holds in his hand something which seems to be a whip. Below these last figures, there are another enigmatic element (Fig. 2, No. 9) and a great serpent (Fig. 2, No. 7) with a forked tongue and a fox-like head. The frieze ends with a large insignia (Fig. 2, No. 11) composed of a Mochica club and shield. Everything seems to indicate that the scene represents a religious procession before a sacrifice.

The upper part of the entire mural is bounded by a motif which, following Sawyer (1954), we have called "step and wave." The lower border of the mural consists of an irregular succession of wave-like scrolls.

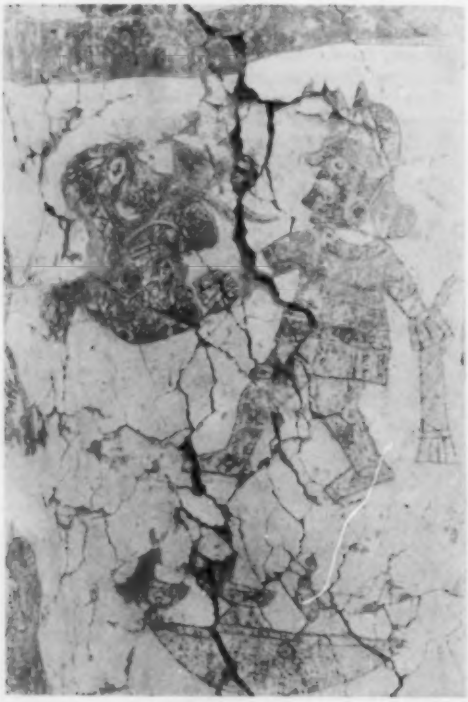

Fig. 5 [Bonavia]. Detail of the original mural painting at Pañamarca showing a prisoner (No. 8 in Fig. 2), the guard with a whip in his hand (No. 10 in Fig. 2), an unknown object (No. 9 in Fig. 2), and portions of other figures.

This frieze was painted on a white background in two shades of white, two shades of light blue, a blue-black, two shades of orange, and various shades of red. The paints were prepared from minerals on a calcite base; the different shades of red were achieved through the use of various iron oxides.

The mural is dated in the chronology of Larco Hoyle (1948). It belongs to the fourth phase of Mochica culture, as do the friezes studied by Schaedel (1951). Some of the elements suggest the slight possibility that it belongs to a somewhat later period.

The principal importance of this mural consists in the presence of certain new motifs, which have not appeared in the previously known Mochica murals. The discoveries in the Huaca de la Luna in Moche, so well described by Kroeber (1930), are very different in their over-all aspects, as are those in the Lambayeque zone studied by James A. Ford in 1959, but which remain unpublished.

From all the indications which we have, it is clear that Pañamarca was a religious center of great importance, especially if we consider that this center seems to be the southernmost Mochica architectural complex now known from the Peruvian coast. In order to have had such splendor, this temple pyramid should have had great centers of population nearby, for it is absurd to imagine a religious construction isolated from the populace. At present, we can only suppose that this great population was in the Santa valley. This supposition is corroborated by Ernesto Tabío, who has encountered numerous Mochica cemeteries and buildings in his latest explorations in the Santa.

In Pañamarca, there is still much to do. On all sides, there are indications of additional paintings, through which we could learn much, not only of the art, but also of the life of this group of warriors and artists who have left such an indelible impression. New studies of these ruins could cast much light, not only on the pictorial aspects of the ruins, but also on their chronology, for Schaedel (1951) has reported Tiahuanacoid remains in cemeteries adjacent to the complex. The Mochica-Tiahuanacoid transitional stage is still not clear, and perhaps it would be possible to obtain important evidence here for this time period. On the other hand, we can now be almost certain that there are architectural remains in this same assemblage which are much older than Mochica—a chronological conclusion reached intuitively by Tello. These earlier remains have not been studied, but Jorge Muelle has tentatively accepted the pre-Mochica age of some of these ruins.

The panorama of Peruvian mural painting is still almost unknown. We know that paintings are present in the Playa Grande period (Stumer 1954), as well as in the Mochica, Tiahuanacoid, Chimú, and Inca periods all along the Peruvian coast. However, to date Mochica period sites have produced the largest number of murals. The new mural painting of Pañamarca is a further ad-

vance in the constant search for reconstructing the culture of the people of ancient Peru.

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UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS
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AGE OF THE SKELETON FROM THE LAGOW SAND PIT, TEXAS

K. P. OAKLEY AND W. W. HOWELLS

ABSTRACT

Measurements of the fluorine, uranium, and nitrogen content of a representative series of bones from Lagow and neighboring terrain show that while the human skeleton from the Lagow Sand Pit is not modern, it cannot be assigned an antiquity equivalent to that of the Lewisville Pleistocene fauna at the site.

PARTS of a human skeleton came to light in the Lagow Sand Pit, on the outskirts of Dallas, Texas, in October, 1920, in association with bones of various extinct mammals. These were reported on by Ellis Shuler (1923). Before he visited the site the human bones had been taken from the deposit, but workmen present all agreed that they lay about 5 feet below the land surface at the spot, and that there was no sign of a grave or any disturbance in the overlying stiff clays. The bones lay in a zone of fine sandy yellow clay, which contained mammoth, camel, a large bison, antelope (*Tetrameryx*) and deer (Crook and Harris 1957: 73). The ischium of a young mammoth and a carapace fragment of a turtle have apparently always been kept with the human bones (Crook and Harris, Fig. 10).

The context, as now known, has been fully presented by Crook and Harris (1957, 1958). The deposit involved is the Pemberton Hill–Lewisville terrace (T–2) of the Trinity River system, at about 70 feet above stream bed. This terrace consists of four subformations from above down: Richards alluvium, Upper Shuler yellow sandy clays, Lower Shuler laminated yellow sands, and basal Hill gravels. The general fauna appears to be late Pleistocene, and includes mammoth, camel, horse, *Glyptodon* and *Smilodon*; *Geochelone* (*Testudo*), and a terrapin, both locally extinct, are abundant. At Lewisville, the Upper Shuler formation contains hearths, which have yielded several artifacts including a Clovis-type point, and a hearth with a radiocarbon age of "more than 37,000 years" (O^n 235, O^n 248). For purposes of this report, we must ignore the still unresolved dilemma of this association, of an apparently reliable date by a reputable laboratory with a projectile point in a tradition which all other evidence indicates was not established for at least 20,000 years after the radiocarbon date. We are concerned only with the correctness of associating the human bones with the fauna and the terrace in which they lay.

The Lagow bones are referred to the Upper Shuler formation. Crook and Harris examined residual exposures at the Lagow Pit, and satisfied themselves that the formations there are identical with their counterparts elsewhere; and they, as well as Shuler, noted that material adhering to the human bones confirmed their derivation from the Upper Shuler zone. All observers noted the apparent fossilization of the bones, and Shuler (1923) reported the following chemical analysis comparing a human sample with a camel bone from the pit:

	P_2O_5	CaO
Human	30.0%	57.8, 32.30%
Camel	31.5%	55.4, 31.04%

Actually, as we now know, neither the lime content nor the phosphate content necessarily changes in course of time. However, from all the superficial signs, the bones appear to be true fossils of the terrace, whose fauna indicates a Late Pleistocene date, and whose geological position would place it in a temperate phase prior to the last glacial event of the Pleistocene.

In his report, Shuler commented that if the Lagow bones had not been human, no question of their Pleistocene association would be raised. However, the find seems to have been ignored entirely. It was reported only a few years before the Folsom discovery, toward the end of the long period during which Hrdlička had successfully put a quietus to all claims to Pleistocene age for American Indian skeletons. The Lagow individual did not emerge again into the literature until Sellards (1952) mapped and recorded the occurrence. Then Crook and Harris (1957, 1958) drew attention to the find in connection with the Lewisville evidence. They pointed to additional sites where the same terrace has furnished indications of human occupation. Accordingly, it has seemed worthwhile to investigate the Lagow skeleton further, with a view to establishing its nature and relative date.

The bones were very kindly sent on loan to the Peabody Museum, Harvard University, by David L. Clark, Director of the Museum of Paleontology of Southern Methodist University, aided by the good offices of Wilson W. Crook, Jr. Samples of bones representing the fauna from this site and another locality were furnished by Bob Slaughter of Dallas, who is studying the original faunal materials and others related to them. Vagaries of storage since the 1920 discovery have precluded certainty about direct association of individual human and animal specimens (except, apparently, in the case of the mammoth and turtle bones referred to), but the provenience of the faunal remains is known quite well enough for the present purposes.

The skeleton is represented by fragments only, although the bone itself is hard, evidently to some extent mineralized, and well preserved as to texture. Present are shaft fragments of left ulna, of right and left femora, of right and left tibiae; part of the left innominate and of one rib; a cranial vault fragment, of the right parietal and frontal bones, another vault fragment of the right parietal and the occipital, and the left half of the body of the mandible with two teeth. Accompanying these are part of the ischium of a young mammoth and a portion of a turtle carapace.

The individual represented is evidently a fairly thick-boned male, of sufficiently advanced years to allow for the almost total obliteration of the coronal and lamboidal sutures. Thicknesses of the vault at various points are:

Parietal, posterior to coronal suture	7 to 10.0 mm.
Frontal, thickest anterior to coronal	10.4 mm.
Parietal, above temporal line	8.0 mm.
Parietal, below temporal line	5.0 mm.
Occipital, posterior cerebral fossa	5.5 to 6.0 mm.
Asterion	8.5 mm.
Occipital, thickest	12.7 mm.

For the mandible, the approximate height of the symphysis was 38.7 mm, and thickness of the body between M2 and M3, 17.5 mm. The walls of the long-bone shafts are thick, and the femoral fragments have a well developed pilaster with strong muscle markings. The nuchal crest and inion, however, are not large. Beyond the above features one cannot judge the size of the individual or of his skull, but no characters are present by which he could be distinguished from American Indians. Certainly there is every sign of a typical member of *Homo sapiens*.

We decided to test a representative series of the bones available from Lagow and neighboring terrain by means of the F–U–N system of relative dating which was developed in connection with the Piltdown researches, and more recently applied to the Rhünda skull in Germany (Oakley 1958). This system is based on the principle that in a temperate realm bones buried in permeable formations gradually accumulate *fluorine* and *uranium*, at the same time gradually losing their protein or collagen (conveniently assessed as *nitrogen*). All three processes proceed at rates varying widely in different environments; but contemporaneous bones preserved under identical conditions have approximately the same F–U–N content. Therefore any bones which are younger intruders in an ancient assemblage will stand out clearly from the rest when analyzed for these three components: the nitrogen content will be closer to that of modern bone (that is, higher), while the fluorine and uranium content will be appreciably lower than in the ancient series.

Determination of any one of these "dating" elements may be a useful indication of the relative antiquity of a bone in comparison with specimens of known stratigraphical age preserved under the same circumstances, but allowance must always be made for some unexpected local factor which has led to an unexpected result. For example, a rhinoceros bone preserved under anaerobic conditions in clay at the Lloyd's site in London, proved to have the same nitrogen content as modern bone, whereas mammoth bone found close by in a layer of sand had a very low nitrogen content. The high fluorine content of *both* bones confirmed their contemporaneity in an Upper Pleistocene context. Since each of the three "dating" components is controlled by a different set of factors, concurring indications from two of them may usually be regarded as very strong evidence of the relative age of a bone under investigation. In an ideal case all three components give the same indication.

Tests on the Lagow bone samples were carried out in laboratories of the British Museum (Natural History). The nitrogen determinations were made by G. C. Ross in the Department of Zoology, using a micro-Kjeldahl technique. The uranium estimations were made by A. E. Rixon and M. Bedale in the Department of Palaeontology, using the method of radiometric assay recently described by Oakley and Rixon (1959). The fluorine content of the material was investigated by a physical method in the Department of Minerals, where G. F. Claringbull and R. J. Davis employed the X-ray powder diffraction technique introduced by Niggli, Overweel, and van der Vlerk (1953). In this method the distance between a suitable chosen pair of lines on an X-ray powder photograph of the bone-apatite varies with the fluorine content. For the lines chosen here (Table 1) the distance between them decreases with the fluorine content. In order to indicate the corresponding probable fluorine percentages in the material under investigation, Table 1 includes X-ray diffraction measurements on three samples which have been chemically analyzed (modern bone F = 0.03%; Midland Skull F = 0.8%; Tepexpan Skeleton F = 1.5%). It may be noted that at Tepexpan uranium was lacking, but the high fluorine coupled with very low nitrogen content sufficed to confirm the great antiquity of the specimen.

The Lagow region is evidently ideally situated for application of the F–U–N system of relative dating, for the ground-water here contains both fluorine and uranyl ions. Thus all three components have given results pointing unmistakably in the same direction: the human bones are considerably more recent than any of the material indigenous to the Pleistocene formations.

Disappointing as these results are to the hope of establishing an actual human skeleton in an antiquity equivalent to that of the Lewisville Pleistocene fauna,

TABLE 1. RESULTS OF THE FLUORINE, URANIUM, AND NITROGEN TESTS ON THE LAGOW MATERIALS

	Fluorine: X-ray diffraction data. Difference in mm. between 2θ(004) and 2θ (140) for copper Kα radiation in 19 cm. diameter powder-camera	*Uranium e.U₃O₈p.p.m.*	*Nitrogen %*
Recent animal bone	3.34 (F=0.03%)	0	4.00
Human rib, Lagow	3.13	3	1.20
Human tibia, Lagow (compact, midshaft)	3.12	0	1.20
Mammoth, Lagow (Immature ischium)	2.65	64	0.40
Camelops, Lagow (assumed to be from human stratum)	2.73	36	0.50
Bone from Lower Shuler sands, condition friable	2.80	37	0.40
Bone from Lower Shuler sands, condition hard	2.75	47	0.50
Horse bone, Hill gravel	2.75	49	0.50
Bison vertebra, Upper Shuler clay, 20 miles up river from Lagow Pit	2.71	14	0.40
Compare:			
Tepexpan human skeleton	2.67 (F=1.50%)	1	0.06
Midland human skull	3.13 (F=0.70%)	13	0.03

they are at least gratifyingly clear. The animal bones give highly homogeneous results for fluorine content, clustering between measurements of 2.65 to 2.80 mm. for six samples of bone, while the two human bones are virtually identical, with readings which are clearly out of this range. The nitrogen results convey the same impression, placing the Lagow man definitely between modern bone and the fauna of the Shuler formation, while the uranium content is more decisive yet. The human bones are evidently not modern; their loss of nitrogen and slight degree of mineralization (as regards fluorine even comparable with the Midland skull) show that they may have some considerable age. In the light of the results, however, they cannot be associated with the Pleistocene fauna, and thus with the terrace deposits, and so they cannot be counted among the items of evidence for the presence of man during the period of the terrace's formation. Crook (1961) provides a reinterpretation of the Lagow find in the accompanying paper.

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A REVISED INTERPRETATION OF THE LAGOW DISCOVERY, TEXAS

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ABSTRACT

The results of the F–U–N tests by Oakley and Howells, which show that the Lagow skeleton is not of the same antiquity as the Pleistocene fauna at the site, make possible a reinterpretation of the depositional sequence recorded by Shuler, who reported the apparent association of human remains with Pleistocene fauna. The Lagow human skeleton is now seen as an intrusive into the Upper Shuler yellow sand after the Pemberton Hill–Lewisville (T–2) terrace had been built up and eroded down to near the level of occurrence. Since the age of the overlying red clays is estimated to be abut 9500 years, the Lagow skeleton may possibly be early Archaic.

THERE CAN BE little question about the rather decisive indications produced by the study by Oakley and Howells (1961) of the Lagow Sand Pit Man's bones. It is a superb contribution by modern scientific technique which throws new light upon an intriguing occurrence of 40 years ago. Thanks to these comparative fluorine-uranium-nitrogen relative age determinations, a completely new interpretation of the discovery is now possible and manifestly necessary. While the Lagow human remains seem to

have a respectable age, they are not of the antiquity of the Late Pleistocene extinct animal bones from the same river terrace stratum, some of which came from the original Lagow site itself. Therefore, two obvious questions require an answer. First, were the bones actually found as reported? And, if so, how and at what time could they have been included in such an older geologic formation?

There is no doubt in my mind on the first question. Shuler was a first-rate geologist and observer. His original *Geology of Dallas County* (Shuler 1918), revised and reprinted several times, is still the standard reference. Again, he was the first to study and recognize the Trinity River alluvial terraces (Shuler 1935), fathering the work of Pattillo (1940), Crook and Harris (1957), and others.

He was a true scientist of the highest integrity, and his veracity and motives in this matter are not subject to question. He never again published on the find through all the years that followed, nor did he crusade for its recognition. His statement about the seeming association of human with extinct animal bones was mild enough in his one brief (11 paragraphs) report on the find (Shuler 1923). With my good friend and coworker R. K. Harris, I have personally verified the geology of the former Lagow Sand Pit. It lies at the edge of the Pemberton Hill–Lewisville (T–2) terrace, where it slopes off to the Union Terminal–Carrollton (T–1) terrace below. It most certainly could have contained a 1920 pit wall section such as Shuler described.

Oakley and Howells (1961) have repeated how the Lagow bones, apparently never fully cleaned nor treated with preservative, still retain traces of yellow sandy clay so typical of all fossils from the T–2 terrace's Upper Shuler stratum. These authors also comment upon the fragments of an immature mammoth and a turtle that seem to have been boxed with the human bones all these years. The mammoth bone was F–U–N tested and compared very favorably with all other animal specimens from the terrace. A logical inference is that these nonhuman fragments were mistakenly considered part of the skeleton, or that they were closely associated with its finding. From personal knowledge, these two pieces were with the human bones in 1952 when the Lagow Sand Pit Man was requested for exhibition before the annual meeting of the Texas Archeological Society at Southern Methodist University that year. Shuler had to search to produce the specimen, finally finding it — still packed in excelsior — in a dusty cardboard shipping box which was addressed to Aleš Hrdlička and postmarked 1924.

As to the second question, if the Lagow Man did indeed occur in the yellow sandy clay, as is highly probable, how and when? The Oakley-Howells tests, indicate that Shuler's own description of the discovery section provides the "key." While this section is available in the literature, this vital section is reprinted (Table 1, italics mine) for immediate comparisons (from Shuler 1923).

It has always been apparent that this section's description represents a sloped-off, eroded remnant of the Trinity River T–2, terrace overlaid with a "veneer" deposit of

Table 1. Section of Lagow Sand Pit

Top soil. Medium grained sandy loam	2 ft.
Sandy clay, *hard, tenacious. Red*	3 ft.
Fine sandy clay with light calcareous segregations and streaks. Texture of sand varies. Color *yellow*. Fossils: antelope, bison, mammoth, *man*	2 ft. 10 in.
Fine to coarse clean white sand and gravel. Gravel usually under one inch. Cross-bedded. Forest beds not over 12 to 14 inches, usually 3 to 4 inches. Fossils usually found at bottom, especially larger bones. Bones clean and usually white or cream in color. Mammoth, camel	14 ft.

the younger T–1 terrace (Fig. 1). Missing entirely is the typical T–2 surface stratum of gray alluvium with small caliche nodules known as the Richards sub-formation (normally 5 feet in thickness.) Next below, the Upper Shuler yellow sandy clays (normally 10 to 20 feet thick) are present only as a "2 ft. 10 in." remnant. Superimposed are the sandy loam and tough red sandy clay of the Pattillo and Albritton sub-formations so universally typical of the T–1 terrace. However, everything *below* the red sandy clay is a remnant of the usual, older T–2 sequence. This circumstance is not remarkable in the Dallas region and can be duplicated at many exposures.

The point is that it was, indeed, present in the Lagow vicinity as can still be demonstrated today. As of now, despite all the earth removal and leveling since 1920, the immediate area of old pit wall adjacent to South Fitzhugh Avenue displays a complete and normal T–2 section, *without* any trace of later deposition. South Fitzhugh Avenue itself and the area on the immediate west side are shown on relief maps as having the almost exact elevation of Pemberton Hill, two miles distant and cotype site of the pure T–2 terrace occurrence. But in the eastern margin of the former Lagow Sand Pit, now the Texas and Pacific Railroad roundhouse yard, and downslope just one city block, typical Pattillo sand, underlain by Albritton red sandy clay, is readily seen in yards, ditches, and slopes. This is at a notably lower elevation.

A recapitulation of ancient Trinity River history is useful to explain the sequence of events. Earlier repeated cycles are disregarded. A major floodplain deposit was built up in the last interglacial period (or a major interstadial of the last "Wisconsin" glacial) when a sea-level higher than today prevailed. This was at a level now 70 feet above present stream-grade or 50 feet above the current floodplain. Based upon radiocarbon ages, the lowermost levels of the Upper Shuler yellow sandy clays of this T–2 terrace at Lewisville are "more than 37,000 years old" (Brannon and others 1957, O–235, O–248). Following this, a major period of valley-cutting correlated with the last major glacial and latest maximum low sea-stand (last glacial — "Wisconsin"?) ensued. Over wide areas near Dallas this cutting cycle removed or sloped-off the old T–2 floodplain deposits and incised deeply into the bedrock.

Then a post-glacial fill took place, culminating at about 50 feet above today's stream-grade and some 30 feet above the Recent floodplain. This is the depositional time of the Union Terminal-Carrollton (T–1) terrace, which has been radiocarbon dated just prior to its maximum by Socony-Mobile (personal communications) at

some 6000 years ago at the base of the Pattillo gray sands. Another valley-cut followed, beginning about 4000 years ago, cutting again into bedrock as a channel incision. From the evidence available, a very late fill of the present floodplain (T–0) began about 700 years ago (about A.D. 1250) and ended about 75 years ago (about 1885). Since that time, the existing channel-cuts — even into shallow bedrock — have been created.

Prior to the F–U–N tests the Lagow human bones appeared to be a primary inclusion in the Upper Shuler yellow sandy clay remnant beneath the later veneer. Such a remnant could only represent the basal portion of this stratum before it was eroded down. This was the more suggestive, since the fireplaces and other human occupation evidences at Lewisville were most common in the basal part of the same terrace deposit.

Now we know that Lagow Sand Pit Man must have been intrusive in some manner. From the many parts of the body represented by the fragments, it could even have been a burial. But Shuler could discern no evidence of a burial fill in the overlying tough red sandy clays. More importantly, had the intrusion been made at any time after the overlying *red* sandy clays first became present, any refill or mixture would have been easily spotted in the *yellow* sandy clay of occurrence. There would also surely be some red sandy clay still on the bones today, rather than the material now present. Therefore, any intrusion must have occurred *before the red sandy clays of the T–1 veneer were deposited.*

On the other hand, the fact that much or most of an entire skeleton was present at one time, indicates that intrusion through any sizable thickness of overburden seems precluded. Very probably the intrusion occurred after the T–2 floodplain had been completely built up and then eroded down at this locality to near the level of occurrence. This would also entail a considerable lapse in time, which fits with the relative age difference between the human bones so intruded and the animal bones of primary inclusion.

Again, once the Upper Shuler yellow sandy clays were exposed by erosion and actually constituted the current ground surface of the time, any burial whether by artificial or natural agency would have been refilled by the same material in which it was intruded. After the passage of some thousands of years, no disturbance or refill would be visible and the bones would lie in a matrix identical to their surroundings. This is a logical assessment in light of present knowledge.

The age of the red sandy clays has been estimated to be about 9500 years ago at their base, beginning the post-glacial depositional cycle. As mentioned earlier, there is a radiocarbon date of about 6000 from the base of the overlying sandy loam deposit. An intrusion of the Lagow Man must be more than some 9500 years in age, then, and very probably not by an appreciable amount. The erosion cut exposing the yellow sandy clay remnant probably was almost complete when it occurred.

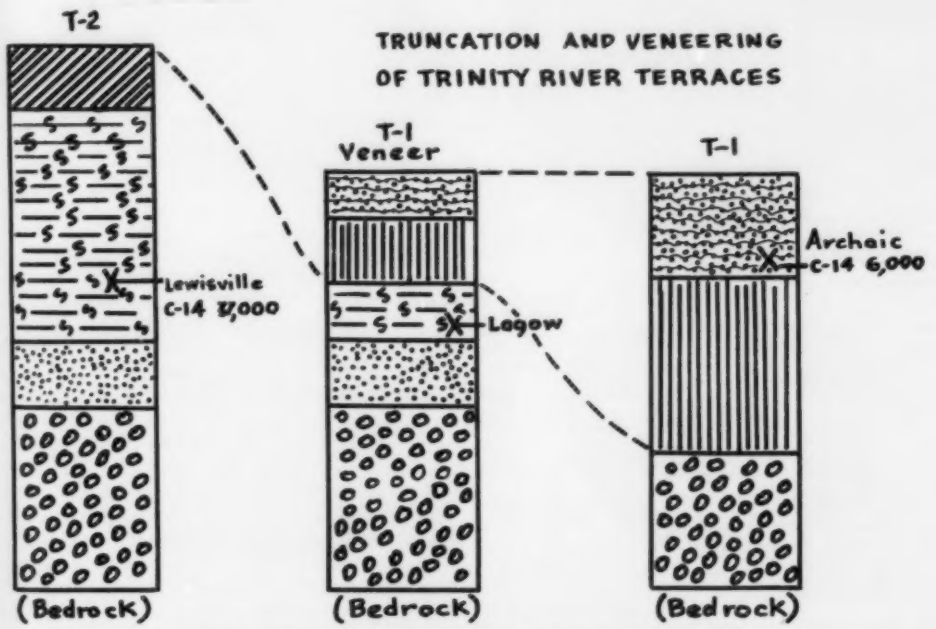

FIG. 1 [CROOK]. Diagram showing the truncation and veneering of the Trinity River terraces at the Lagow Sand Pit and other sites.

In fact, the Lagow Man may well have been of the Archaic cultural stage, or immediately ancestral. In the Dallas region Archaic sites are plentiful and have been found in place as deep as the mid-zone of the T–1 red sandy clays. Elsewhere, Archaic sites have been radiocarbon dated with ages up to 10,000 years and more. Since no artifacts accompanied the bones, this is purely speculation, but certainly a possibility. The nearest known paleo-Indian sites of this vintage are at Lubbock and Plainview out on the High Plains.

I do not feel that any comparisons with the F–U–N determinations on either the Midland or Tepexpan human remains are useful, since ground water and geologic conditions differ so greatly in the three areas.

A final dividend from the Lagow studies is the information gained from the close agreement among the various animal bones tested. Such agreement in relative age obtained whether the specimens came from different exposures of the T–2 terrace or from different strata within the terrace sequence. This seems to prove (1) that the T–2 terrace as presently defined is a continuous and recognizable deposit wherever it is exposed in the area, despite some controversy over minor variance in elevations and "plane-table" mapping of terraces vs. lithology and fossil content; and (2) that the basal Hill gravels of the T–2 sequence belong to the same cycle of deposition as the overlying strata. Some authors hold that basal gravels of river deposits pertain to a previous cycle, with obvious implications for paleontological inclusions.

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Dallas Archeological Society
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A RADIOCARBON DATE FROM THE CENTRAL COAST OF PERU

Louis M. Stumer

Abstract

A specimen from a bundle of rope found at Playa Grande in association with pottery of Playa Grande I style and the white-zoned and white-slipped varieties of the Baños de Boza style is dated at A.D. 570 ± 160 (L-384A). Since the Playa Grande ceramic style has good crossties with Late Mochica, Salinar, Puerto Moorin, Maranga, and Nazca styles, this date tends to substantiate the generally accepted but not clearly demonstrated contemporaneity of the Mochica 3, 4, 5 sequence on the North Coast with the Playa Grande, Maranga sequence on the Central Coast and the Nazca A, B, Y development on the South Coast.

BEGINNING in March of 1952, and continuing throughout most of that year, I excavated at the site of Playa Grande (Stumer 1953; Tabío 1957) which is located on the south side of the Ancón peninsula, some 22 miles (36 km.) north of Lima. The area consists of a desert pampa, or plain, hemmed in by a spur of the Andes foothills on the south, east, and north. On the western side, the pampa slopes abruptly down to a curving beach divided into two fairly equal parts by a rocky headland gleaming white with guano deposits. The pampa is approximately 1½ miles square; the westernmost square mile was covered with public buildings, house sites, middens, and cemetery areas. There was evidence of a small living area extending into the southern half of the beach; the northern half showed no signs of pre-Columbian occupation. However, a small preceramic site was located on the slopes of the foothills above the northern half of the beach. I describe the Playa Grande site in the past tense for a good reason. The entire zone is now the fashionable Lima beach resort of Santa Rosa, and all archaeological material, except for what must show up when excavating for the foundations of a new beach house, has been obliterated.

Excavations were made in all parts of the occupied area in a zone of wattle-and-daub house sites, in the public buildings, in cemetery areas, and in the middens. The excavations showed that Playa Grande was occupied solely during the Formative epoch. There are two clearly defined ceramic types, which I have been calling Playa Grande 1 and 2. The former appears in association with certain varieties of the Baños de Boza style (Willey's white-on-red; Strong, Willey, and Corbett 1943: 184–96), namely the White Zoned and White Slipped; the latter appears to equate with the very early phases of the Maranga style (Cajamarquilla, Nievería, Proto-Lima). Both types belong to the culture formerly known as Interlocking (Strong, Willey, and Corbett 1943: 149–53). Because of the relative cultural purity of the site, and because of the confusion resulting from the use of the technical term "interlocking" as a name for a culture, the name was changed to Playa Grande in 1953 (Anony-

mous 1953: 13–15) and confirmed in 1958 (Anonymous 1959: VII–VIII).

The radiocarbon-dated specimen came from a bundle of rope made from the fibers of the tortora reed (*Scirpus americanus*?). The rope appeared to be about 40 feet long when the bundle was excavated and unpacked. It was in most excellent condition, found at a depth of 46 cm. in completely dry sand in association with a storage jar of the White-Zoned variety of the Baños de Boza style and several sherds of the Playa Grande 1 type. The specimen was located in a shallow storage pit directly outside the entrance of a simple cane-and-clay dwelling. There was no evidence of any later occupation, seepage of any kind, or the visitations of grave robbers. Through the good offices of W. D. Strong of Columbia University the specimen was submitted to the Lamont Laboratory. The date is A.D. 570 ± 160 (L–384A).

In order to assess the significance of this date, it is necessary to review the related dates for the North and South coasts, as well as the pertinent stylistic cross references. The Playa Grande specimen under discussion was found in association with varieties of the Baños de Boza style, which has been equated (Bennett and Bird 1949: 112, 139) with the Salinar style of the Chicama valley (Larco 1948: 20–2) and the Puerto Moorín style of Virú valley (Strong and Evans 1952: 295–300). The radiocarbon dates for the North Coast would appear to place Salinar and Puerto Moorín at about 640 to 40 B.C. (Bird 1951). Three points present themselves in this connection: (1) the present Playa Grande date is erroneous; (2) the Salinar dates are incorrect; or (3) the equation of the three styles is invalid. I have stated many times that I am not in accord with the postulation of a White-on-Red horizon, for it seems to me that this is too primitive and too simple a technique upon which to base a stylistic horizon. Added to this is the fact that white-on-red painting is not sufficiently general throughout the area of the Andean co-tradition. The present radiocarbon date for the Central Coast would appear to bear out this contention.

On the other hand, there is stylistic evidence (Stumer 1958: 16, 17, Fig. 5) to equate late Mochica, Larco's Phases 4 and 5 (Larco 1948: 32, 36, 75–6), with the Maranga style of the Florescent epoch of the Central Coast. The Maranga style, from both stratigraphy and stylistic evidence, follows directly upon that of Playa Grande. Available late Mochica dates range from about A.D. 110–650 (Bird 1951; Strong 1957: 46), with the earlier date being the most suspect. If one accepts the early part of the range given for the Playa Grande speci-

FIG. 1 [STUMER]. Pottery of Playa Grande 1 style from Playa Grande and Márquez, Peru. *a–c*, Playa Grande site, from Cut 3, an extension of the trench in which the rope used for the radiocarbon assay was found; *d*, Márquez site, near the mouth of the Chillón River, from a grave of early Playa Grande style. Maximum diameter of *c*, 16.5 cm.

Fig. 2 [Stumer]. Vessel of Playa Grande 1 style from a tomb in Cut 4 at Playa Grande. Height 15 cm.

men, or even the date itself, no great conflict appears between the stylistic and radiocarbon evidence for the Playa Grande–Maranga relationship. Another confirming factor is the interrelationship of the Copa (Recuay) style of the Callejón de Huaylas (Stumer 1957: 281–3, Fig. 14; 1958: 24) with the Playa Grande and Maranga styles, and its relationship, in turn, with Mochica (Bennett 1946: 106–7).

At Playa Grande there was a fairly strong element of Nazcoid design appearing toward the end of the Playa Grande 1 type. Conversely, Central Coast design elements prominent in the Playa Grande style appear occasionally in Nazca A, and there are also designs common to both Nazca B and Maranga (Stumer 1958: 21–2). In my 1957 and 1958 excavations in the Cañete valley the same resemblances were found for the corresponding periods, giving supporting evidence in a valley roughly midway between Playa Grande and the Río Grande (Nazca) drainage, but still pertaining to the Central Coast region. Strong's (1957: 46) radiocarbon dates from Cahuachi in the Nazca valley range from A.D. 325–525 for the Nazca A and B styles. Strong has two dates, A.D. 755 and 756, for the Nazca Y style, which he calls Huaca del Loro from the type site he excavated. There are design elements common to Nazca Y and Maranga.

These considerations certainly tend to demonstrate the contemporaneity of Mochica 3, 4, and 5 on the North Coast with Playa Grande and Maranga on the Central Coast and Nazca A, B, and Y on the South Coast, a correlation hitherto more or less generally accepted, but only now supported by radiocarbon as well as stylistic evidence. On the basis of archaeological considerations I believe that the majority of the radiocarbon dates set forth here tend to be late, and that the earliest possible date for the Playa Grande specimen will eventually prove to be closer to the mark. The same, naturally, should hold true for the Mochica and Nazca dates of the same series. In support of this conjecture, it is interesting to note the discrepancy of 249 years that appears between two halves of the same specimen collected by Strong and dated by two different laboratories (Strong 1957: 46). To sum up, the Playa Grande date has provided us with extremely valuable stylistic cross references, while apparently putting all the related styles at slightly too recent an absolute date.

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April, 1960

FLUTED POINTS ON THE SOUTH CAROLINA COAST

A. J. Waring, Jr.

Abstract

Four points of Eastern Clovis type, found in Beaufort and Jasper counties at sites which also produce points of the Savannah River Archaic, are the first occurrence

of fluted points on the southern Atlantic coast. The flint source was apparently the extensive quarries along Briar and Buckhead creeks located chiefly in Screven and Burke counties, Georgia. Other finds of fluted points along these streams indicate a paleo-Indian occupation within the drainage, but no sites are yet known.

FURTHER EVIDENCE of the distribution of fluted points comes from coastal South Carolina. It is the first occurrence of these points from the southern Atlantic coast. The two bases and the larger of the two complete points (Fig. 1 *a*, *c*, *d*) were found on the beach of an eroding bluff in front of the summer home of John Cubbedge on Myrtle Island, 1½ miles east of the town of Bluffton, Beaufort County, South Carolina. The bluff profile, about 10 feet high, shows a deeply weathered tan sand. There is no evidence of midden. Several other scattered artifacts found along the beach, chiefly projectile points, are clearly Savannah River Archaic.

The smaller of the two complete points (Fig. 1 *b*) was found by Jocelyn Clark on Spring Hill Plantation, Jasper County, South Carolina. The location of the find was a low clay knoll overlooking tidal salt marsh approximately 3 miles east of Coosawhatchie. Other points were found at this site, but these also belong to the Savannah River Archaic. No pottery was found at either site, and none of the other artifacts found belong to the paleo-Indian assemblage.

All four points are within the range of the Eastern variant of the general Clovis type. More than one attempt had been made to draw the fluting flake. The completed points are rather thin at the base and thicker towards the tip. Light basal grinding was observed in all cases. The points have been examined by John Witthoft, Douglas S. Byers, and Frank H. H. Roberts, Jr.

The materials are of a rather fine and varied flint typical of deposits laid bare along Briar and Buckhead creeks in Burke and Screven counties, Georgia. Briar

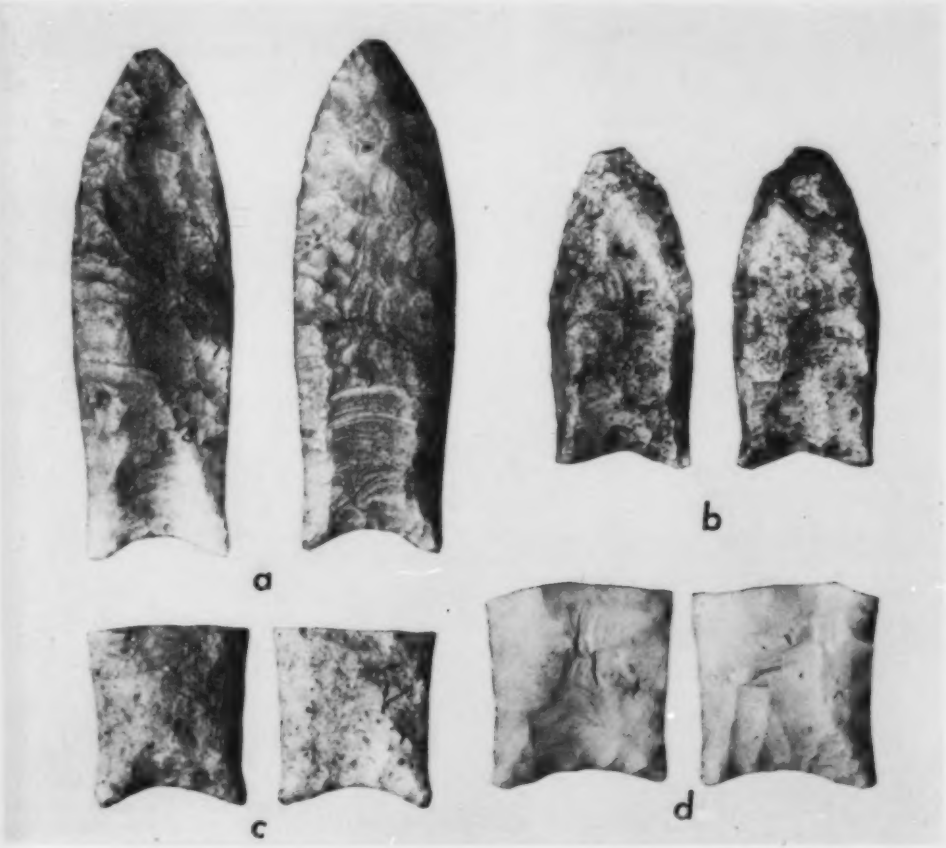

FIG. 1 [WARING]. Fluted points from coastal South Carolina. *a*, *c*, *d*, Myrtle Island, near Bluffton, Beaufort County; *b*, Spring Hill Plantation, Jasper County. Actual size.

Creek enters the Savannah at a point 30 miles west of Bluffton. Extensive flint-knapping sites are located from its confluence all the way along its course for at least 25 miles. Similar quarries and flint-knapping sites occur along Buckhead Creek which is separated from Briar Creek by a narrow divide and drains into the Ogeechee. It was on Buckhead Creek that Steiner found the fluted points figured by Caldwell (1952, Fig. 167). Malcolm Bell, Jr. of Savannah found the basal half of a fluted point on Briar Creek 4 miles southeast of Girard, Burke County. Deeply patinated, it is fluted on only one side.

It might be mentioned that in the late 1930's A. R. Kelly saw several beautiful fluted points in the collection of a preacher, the father of the novelist, Erskine Caldwell, who lived at Wrens on upper Briar Creek. He admitted that he had found them locally, but died without divulging the location of the site. It is apparent, therefore, that a paleo-Indian situation exists in the Briar Creek drainage, although no sites have been located.

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Savannah, Ga.
September, 1960

A GLACIAL KAME WOLF MASK-HEADDRESS

Raymond S. Baby

Abstract

A worked wolf cranium discovered in burial association at a Glacial Kame site near Russells Point, Ohio, is interpreted as part of an animal mask-headdress. This is the first record of the use of such paraphernalia by the Glacial Kame People, and probably one of earliest evidences of ceremonialism in the Ohio Valley.

IN 1955, 75 to 90 Glacial Kame burials were discovered during sand and gravel operations of a glacial esker on the Clifford M. Williams farm, located ¾ of a mile west southwest of Russells Point at Indian Lake, Washington Township, Logan County, Ohio. In spite of the extensive damage to the site and the graves as the result of quarry operations, ten complete burials, 23 skulls, and numerous miscellaneous long bones were recovered by Williams and an Ohio State Museum salvage party. Unfortunately, Williams did not record the depth of burials nor the position of remains. Three of the four burials carefully excavated by the Museum party were found in a rightly flexed position, placed one on top of the other, in a nearly circular pit, measuring 3.5 feet in diameter and 3 feet in depth; the fourth burial had been placed in the bottom of a 6.2 feet deep pit, the deepest recorded at the site. Cultural remains recovered by Williams included fresh-water shell spoons, disc-shaped beads, circular and sub-rectangular shell gorgets, birdstones, atlatl weight, copper beads, and bone awls.

In one of the burials (No. 7) recovered by Williams were found fragments of two artifacts fashioned from wolf skulls. Careful sorting, cleaning, and restoration of fragments revealed one nearly complete wolf cranium and part of a second specimen. Both crania show marked signs of preparation such as cutting, breaking, grinding, scraping, and drilled perforations; bony eminences are nearly obliterated.

The complete artifact clearly indicates that it had been cut from the cranium of a young, adult wolf. The en-

Fig. 1 [Baby]. Lateral view of the worked wolf cranium and that of a gray wolf. Dotted lines and arrows on the complete wolf cranium (below) indicate sites of removal of bony parts and drilled perforations on the artifact (above). Drawing by Bruce R. Baby.

Fig. 2 [Baby]. Top view of the worked wolf cranium and that of a gray wolf. Dotted lines and arrows on the complete wolf cranium (right) indicate sites of removal of bony parts and drilled perforations on the artifact (left). Drawing by Bruce R. Baby.

tire posterior and basalar portions of the cranium had been removed by cutting obliquely through the parietal crest, posterior parietals, squamous temporals, inferior portion of the orbital and temporal wings of the sphenoids, perpendicular plates of the palatines, and the postsphenoid (Figs. 1, 2). The zygomatic arches were probably broken at the point of articulation with the zygomatic process of the maxillae; the rough articular surface was then ground, exposing the roots of the molar teeth. The nasal aperature shows signs that it had been altered by breaking of the anterior portion of the nasal bones, and by removing and grinding the nasal processes of the pre-maxillae at the level of tips of the nasal bones. The posterior nasal spine is ground and somewhat flattened. In view of the extensive alteration it might be assumed that much of the internal structure of the cranium had been removed. The drilled perforations, two on the left side of the vault and part of one on the right, are 2 mm. in diameter and unilaterally drilled from the exterior. The distance between the two on the left side is 2.1 cm.

The deliberate and careful preparation of the artifact suggests that it was worn as part of a mask-headdress, placed against the forehead and resting on the bridge of the nose (Fig. 3). The drilled perforations were probably used to secure the artifact to the wolf skin.

The use of wolf and cougar animal masks is known for the prehistoric Adena (Webb and Baby 1957: 61–72); and the use of a human mask-headdress, for Hopewell (Baby 1956). This is the first record of an animal mask-headdress for the Glacial Kame Culture, and probably the earliest evidence of ceremonialism and the use of such masks in the Ohio Valley (Fig. 3).

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OHIO STATE MUSEUM
Columbus, Ohio
November, 1960

MICROBLADES AT CAHOKIA, ILLINOIS

RONALD J. MASON AND GREGORY PERINO

ABSTRACT

Small blades, blade tools, and cores recently found at the Cahokia site, Illinois, represent a microblade industry probably affiliated with the Old Village stage of Middle Mississippian. The artifacts are described, and attempts to assess their probable functions are discussed. The available comparative evidence is insufficient to demon-

FIG. 3 [BABY]. Reconstruction of the mask-headdress in use. Left, probable position of the bony portion of the wolf mask-headdress when worn; right, semi-conjectural restoration of the mask-headdress when worn.

strate the degree of historical relationship, if any, between this newly defined industry and such other blade industries in the eastern United States as Poverty Point and Hopewell.

A HERETOFORE unreported flint industry, seemingly related to the Old Village occupation, has just been recognized at the huge Mississippian complex of Cahokia in western Illinois. The discovery of artifacts representing this industry, comprising true microblades, tiny implements made from microblades, and the prepared and usually exhausted cores from which the blades had been drawn, was made in the field by Perino. He brought the discovery to the attention of Dan F. Morse, then at the University of Michigan, who, with Perino, informed Mason of the finds. The purpose of this report is to place the new finds on record and to provide a brief description of the industry as it now is known. Field work and the ascertaining of associations with other cultural material were done by Perino. Mason is responsible for describing the artifacts in the sample provided him, for the necessarily sketchy comparative statements, and for the over-all writing of the report.

Microblades and tools based on them have been found to occur generally throughout those areas of Cahokia that yield a preponderance of sherds of Old Village style when other cultural material is present. Where the microblade industry is most abundant, however, little refuse (including shell) is evident. The main area covers approximately three acres and is situated on a ridge forming the north bank of Cahokia Creek; it begins at the Kunemann Mound and follows the ridge southward. There are other areas, too, where the tiny implements are found on the surface in great numbers. All of these microblade-yielding areas fail to produce such other types of flakes as those struck off projectile points and the other more common types of flint artifacts during manufacture. Across Cahokia Creek microblades and microblade tools have been found on the Ramey site, and here surface collecting and excavation have revealed thousands of shell beads and enormous quantities of burned conch columellas and shell scrap. That shell beads and other shell artifacts were manufactured at Cahokia in prodigious amounts is beyond question; and it seems a reasonable inference that many of the microblade tools, especially the drills, had been involved in this activity. The big puzzle is: why is shell scrap so comparatively rare in just those areas where the microblade industry is most abundantly in evidence? It may be that only the finished blanks were drilled in these areas after the grosser work had been accomplished elsewhere.

The following description of the artifacts is based on an analysis of unbroken specimens. These are divided into three categories described in turn: unworked microblades, or "blades" for short, tools based on the blades, and cores from which the small blades had been drawn.

Available for detailed examination were 58 whole, unworked blades (Fig. 1, bottom); 19 more were broken and hence ignored in the final, written analysis. The complete specimens comprise 9.5% of the total sample of unbroken artifacts (excluding cores) representing the Cahokia microblade complex. The small blades or microblades or bladelets are true "blades" in the European sense of the term. The outer or non-bulbar face is bifaceted in 22 cases, and trifaceted in 33; the remaining three blades exhibit four longitudinal flake scars or facets on their outer faces.

Fifteen specimens end in hinge fractures, the rest feathered out cleanly from the nucleus. A high proportion of the tiny blades are twisted about the long axis. This is an interesting feature of the industry whose significance, if any, is unknown. Perhaps a measure of the success or "sophistication" of a blade industry such as this might be reflected to some degree in the relative number of blades showing little or no twist such as that described. Given a suitable core, the detaching of a good number of straight blades would certainly affect an economy of core use (number of "good" blades drawn per core) as well as present the user of these products with a more uniform blank for the fabrication of blade tools. If the Cahokia blade-makers were striving for straight blades, and this is our assumption, their efficiency rating as measured by our sample is only 50%. Eighteen blades

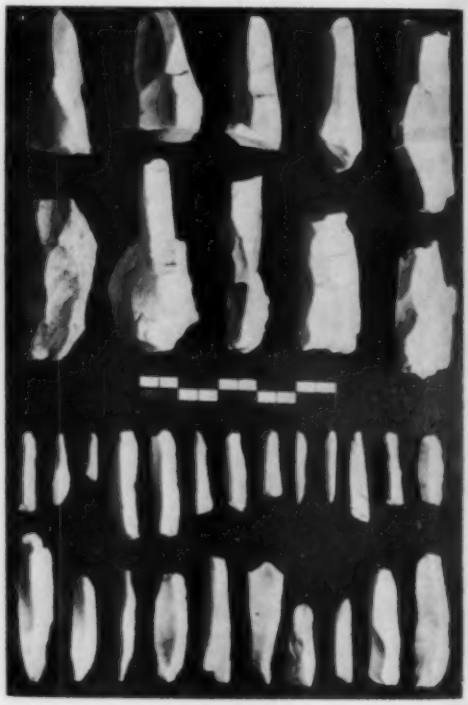

Fig. 1 [Mason and Perino]. Cores (top) and unmodified microblades (bottom) from the Cahokia microblade industry, Illinois. The scale is 5 cm. long.

show a clockwise twist about the longitudinal axis, and 11 have a clear counterclockwise twist. Thus fully half of the blades deviate fairly evenly about the straight (ideal, from our viewpoint) blade. Whether this has any cultural significance is another matter.

The maximum length of the unmodified blades ranges from 12.0 to 38.0 mm. with a central tendency measured by the mean at 23.9 mm. with a standard deviation about the mean of 5.4 mm. The data depart somewhat from a normal curve, the distribution being slightly left skewed. Width data for whole, unworked blades show an average of 6.4 mm. within a range of 2.0 to 11.5 mm., while the average thickness is 2.8 mm. within a range of 1.0–5.0 mm.

A total of 501 unbroken tools based on microblades retained clear evidence of flaking pattern and wear characteristics and were examined with the aid of a low-power (2.3 x and 4.0 x) binocular microscope. Omitted in this study were several dozen "highly weathered" tools whose greatly worn and polished surfaces precluded analysis of the chipping; the factors responsible for this extreme "wear" seem adequately to be explained by the one-time existence of a chicken farm where these were picked up. Also omitted in this study were all broken tools, although these were examined to see if they offered any information the unbroken specimens did not.

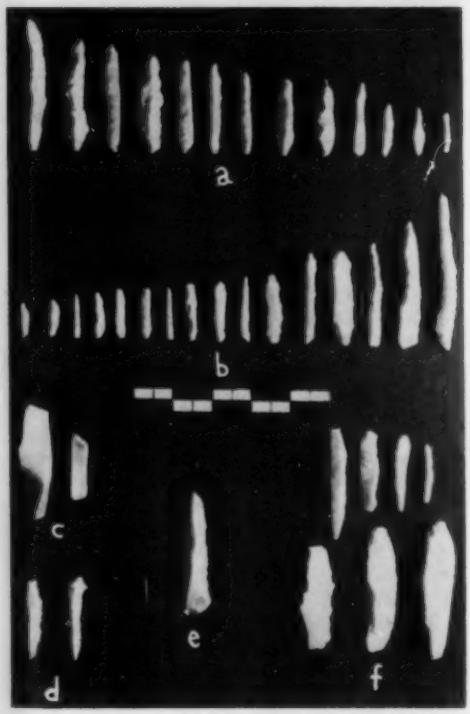

FIG. 2 [MASON AND PERINO]. Unbroken tools made on microblades of the Cahokia microblade industry, Illinois. *a*, double-ended drills; *b*, single-ended drills; *c*, single-ended chisels; *d*, double-ended combination drill and chisel; *e*, combination side- and end-blade; *f*, side-blades. The scale is 5 cm. long.

In the course of study it became apparent that the edge configurations of the tiny implements were a result of purposeful chipping as well as chipping resulting from wear. Indeed, it was not always possible to rigorously distinguish one type of chipping from the other. In general, however, the entire edge or edges of a tool had been intentionally flaked, and unmistakable evidence of wear-chipping usually was confined to the ends of tips and contiguous lateral areas. This edge preparation and trimming was variable, but the great majority of specimens had been rather uniformly treated. Usually, the bulbar face (that which originally was against the core) was left smooth, and the outer or faceted face had been chipped by pressure and wear exerted against the edges from the bulbar face. All of the various patterns were noted and their frequencies recorded. The presentation of these minutiae does not seem warranted here, but it is on file in the Neville Public Museum. Suffice it to observe that extensive chipping along more than one edge is recorded in 459 of the 501 complete specimens analyzed. Thus, the overwhelming majority of blade tools from Cahokia have been modified from their originally flat to triangular blade cross section to a more or less rod-shaped product. In most cases, this chipping does not extend entirely across all the original blade facets; indeed, it is characteristic of the tools that they retain sections of the original facets above each of the chipped edges. The rod shape is a function of intended and actual use, most (84.2%) having been used exclusively as drills. Dual-purpose tools, with only one end specialized for drilling and the other seemingly trimmed for a different function, if added to this figure, raises it to 92.5% of the total.

Seven varieties of blade tools emerged from the detailed study of flaking pattern and edge wear. These fall into three major groups: single-ended tools, double-ended tools, and side-blades. Two (or more) functions seem to have been combined in the same implement in certain cases. The single-ended blade tools are drills (230 examples, or 45.9% of the total, see Fig. 2 *b*) and chisels or gravers (10 specimens, or 1.9%; Fig. 2 *c*). Double-ended implements are blades with a drilling tip at each end (192, or 38.3%; Fig 2 *a*), double-ended chisel (1 specimen, or 0.1%), and blades with a drill tip at one end and a chisel-like edge at the other (42 examples, or 8.3%; Fig. 2 *d*). Side-blades, evidently used in scraping operations, account for 15 specimens (2.9% Fig. 2 *f*). The remainder (11 specimens, or 2.1%; Fig. 2 *e*) are combination side- and end-blades. The workmanship on many of the tiny tools is superb. A few of the smallest implements are only a little thicker than the wire in a standard paper clip, yet they are minutely chipped round their entire circumference. Some of the drills, however,

have surprisingly bulbous tips, but microscopic examination reveals clear indications of rotary wear in the scars and polish on high points of the tips.

Metrical analysis of these various forms failed to yield any significant size differences among them, save that side-blades, as might be expected, are broader than the completely worked end-blades. A collection of 608 unbroken tools based on microblades was measured; this includes the highly "weathered" tools that could not be included in the formal analysis. The length of these tools ranges from 9.0 to 47.5 mm. The sample mean and standard deviation is 19.1 and 5.3 mm. The internal variability of the sample for length is 27.7% as measured by Karl Pearson's coefficient of variation (Moroney 1956: 64–5). The distribution shows slight positive or right skewness. Data on the greatest diameter of these tools show a mean of 4.9 mm. with a standard deviation of 1.3 mm. within a range of 1.5 to 11.5 mm. The coefficient of variation for greatest diameter is close to that for length, being 26.5%.

It is evident from the over-all configuration of the blade tools and from examination of edge retouch and wear that the vast majority were intended for use as end-blades and were so utilized. Some of the blade tips had been trimmed for use as tiny scrapers, chisels, or gravers, but the predominant function was for perforation or drilling. The great numbers of shell beads from Cahokia may be the result of this use. The small size of the micro-drills suggests that many of them, if not all, must have been hafted, perhaps for employment with the bow-drill. Four specimens retain distinct traces of what seems to be a still-adhering resin or pitch which may have been the means by which the tiny drills were secured in a haft.

Twenty-seven cores, evidently relating to the microblade industry, are present in our sample from Cahokia. They range in maximum length from 21.0 to 52.0 mm. with a mean of 39.4 mm. The average thickness of all cores is 22.0 mm., and the number of blade scars or facets on a core varies from a totally unique one to 13, with an average of eight blade scars per core. Other scars reflect trimming and not the drawing of blades or bladelets. Almost all of the cores are exhausted, and some of these have seen re-use as scrapers and hammers. The cores seem to have been made from quarried chert; several of them clearly are based on short but heavy flakes removed by percussion from sizable blocks of chert. These latter exhibit pronounced bulbs (on eight of them) or, in some instances, cones of percussion (on three specimens). Thus, at least 11 cores (41%) from which microblades were removed, were themselves flakes removed from other, larger cores. The microblade cores break down into two major categories.

The first group (Fig. 1, top), represented by 17 examples, may be described as roughly columnar in shape, longitudinally faceted, and predominantly bipolar with respect to the establishment of striking platforms,—only 2 of the 17 cores in this group have had blades struck off from one end exclusively. The angles between the striking platforms and the blade facets are usually acute, sometimes obtuse, and rarely are 90 degrees. The average number of blade scars per core is 7.8. One of the cores, originally a thick percussion-removed flake itself, superficially resembles a burin. Most of the cores are virtually exhausted, and but slightly resemble the familiar prismatic and polyhedral cores of the Hopewellian tradition, or the Denbigh Flint complex, or the illustrated versions of the Mexican blade industries. By comparison with cores such as these, the Cahokia cores are decidedly crude. The second group of cores (ten specimens) may be characterized as chunky, indeed amorphous, in shape. An average of 8.2 blade scars per core radiate from all edges offering a convenient striking platform.

Careful comparison of the Cahokia microblade industry with other blade industries in the eastern United States is precluded by the lack of published, detailed descriptions of such other material. Nevertheless, a few observations may be attempted.

If the specimens from the Pool and Irving sites in Illinois are representative of Illinois Hopewellian blade tools in general (and a search of the literature available to us suggests that they are not radically different), we would suggest that the term "flake knife" be either dropped or be applied only in those cases where knife use actually is indicated. All of the few specimens illustrated from these sites are clearly end-blades (McGregor 1958: 119–21, 125–7, Figs. 40, 43). The absence of marginal chipping is in marked contrast to the Cahokia blade tools. Assuming the representativeness of the illustrated specimens for the blade industry at the Pool and Irving sites, Hopewellian blades, at least at these two stations, are decidedly larger than the Cahokia specimens. What information is available from Ohio suggests that a similar relationship holds with Ohio Hopewell blades. The "flake knives" found in the Seip Mound, and in the fields around the mound (Mills 1909: 50), and those from the Edwin Harness Mound, at least as illustrated (Mills 1907: 71), are all much larger than the Cahokia blades, although there is a little overlap in the range. That Hopewellian blades in general are substantially larger than their Cahokia counterparts seems indicated also by the data presented by Ford, Phillips, and Haag (1955: 146–8) in their comparisons of Hopewellian and Poverty Point (Jaketown) blades. None of the carefully flaked tools, such as rod-like drills and chisels, so characteristic of the Cahokia complex seem to be a significant element in Hopewell. The fine polyhedral cores of Hopewell are likewise missing at Cahokia. Aside from some of the Baum specimens (Mills 1906: 47), we have no descriptive data on the "flake knives" assigned by Griffin (1943, Tab. 14) to the Fort Ancient aspect.

The Poverty Point microblade industry, as described for the Poverty Point and Jaketown sites, while still distinct from the Cahokia material, does offer closer parallels than Hopewell (Ford, Phillips, and Haag 1955:

137–50; Ford and Webb 1956: 76–82). The Poverty Point cores, while clearly "blade" cores, differ radically from the Cahokia examples in these important respects: the Poverty Point cores are based on pebbles, they only rarely exhibit blade scars around their entire circumference, the striking platforms are located at one end of the core almost exclusively, and cores based on flakes appear to be absent entirely. Only in size do the cores from the two complexes coincide at all closely. Although averages are not given, the range of length, breadth, and thickness of the Poverty Point unmodified blades indicates that they are smaller than the Hopewellian blades, and that the Cahokia blades are smaller than either.

Notched blades, such as those illustrated in the Jaketown report, are not represented in the Cahokia sample. The Jaketown and Poverty Point end-scrapers, side-scrapers, "Jaketown" and "blunt" perforators, and needles are not strictly comparable to the blade tools from Cahokia. The retention of a virtually unmodified section of the blade at one end as a sort of "tang" so typical in the illustrated Poverty Point tools is relatively rare at Cahokia; the latter tools are characteristically worked down to a more or less completely chipped rod. But, as Haag has noted for Poverty Point and Jaketown (Ford and Webb 1956: 77), the end purpose of the Cahokia microblade industry was to produce perforators, that is, drills at Cahokia. Unlike the southern implements, however, the Cahokia microblade tools have been, at least in part, intentionally worked, and their form does not seem to be the result of just specialized use. Both Hopewell and Poverty Point are united with Cahokia in having a true blade component. Beyond that similarity they do not seem closely related.

It is interesting (if not alarming) that the microblade industry at Cahokia has not been recognized heretofore. It is represented in many local collections. It will be important that persons working with Mississippian sites elsewhere, particularly those on the Old Village time level, examine their collections carefully to see if these artifacts are present. According to Baerreis (letter to Perino), they have not been recovered at Aztalan. At present it is impossible to say much about their temporal position, save that at Cahokia, such cultural material as is associated with the microblade industry relates to the Old Village occupation. Small numbers of microblade tools have also been found by field parties of the Thomas Gilcrease Foundation on such late Mississippian sites as the Banks Village site and the Rose Mound. They are also present, at least the blades, at some components of Oneota (McKern 1945: 134, Pl. 38) and Fort Ancient (Griffin 1943).

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Neville Public Museum
Green Bay, Wisc.

Thomas Gilcrease Foundation
Tulsa, Okla.

November, 1960

B.P.: BEFORE PRESENT, OR BAD POLICY?

Junius B. Bird

Abstract

The difficulties of using B.P. for radiocarbon ages figures is discussed in terms of the contrast between an age and a date, and the abandonment of the B.P. method of expressing dates is urged.

WHEN B.P. appeared on the scene, it seemed reasonable to suppose that it would disappear quickly. As no objection to its use has appeared and as the term is occurring with increasing frequency, a plea against it seems in order.

What is wrong with the words age and date and what does B.P. add to the situation? When someone tells you that a particular house is 213 years old, the meaning is obvious. Such a statement is true only at the time when made, while the alternative, "This house was built in A.D. 1747," is explicit. Note that this was written in 1960 and the arithmetic is not based on a F.P. (future present) publication figure. If one wants to use age figures, there is no need at all to B.P. them. Even worse is the untenable and impossible thing, a B.P. "date" expressed as a figure which means only age.

Just what do the users of B.P. expect of their readers? If the reader needs such a plain, simple, old-fashioned thing as the date of an event which has been recorded in B.P. figures, is he to calculate from the time he is reading, the publication date, the date when written, or the date when the radiocarbon, obsidian, or other measurement was made? Users of B.P. should be compelled to clarify

this point, for example, B.P. (1948), B.P. (1961), if they persist in this habit.

There are already enough problems with radiocarbon age figures without adding more. In fact, as the years pass, there will be reason to regret that many of the listed age figures were not published together with the dates calculated from the time measurements were made. It does not matter that the process cannot yield a precise date, but it does matter that varying date figures will be quoted for the same event. Certainly B.P. is no solution, and I sincerely hope that this B.P. concept can be flushed out of the minds of its advocates down to where it belongs before our literature is further complicated or polluted by it.

American Museum of Natural History
New York, N. Y.
December, 1960

A NEW POINT TYPE FROM HELL GAP VALLEY, EASTERN WYOMING

George A. Agogino

Abstract

The Hell Gap point, excavated from a cultural level dated by radiocarbon at 8890 B.C. (10,850±550 B.P.), is described by H. M. Wormington. It represents the oldest known cultural level at Hell Gap, an extensive multi-component quarry site occupied by paleo-Indian groups over a considerable period of time.

IN THE HELL GAP valley of east central Wyoming, some 13 miles north of the town of Guernsey, a series of sites or stations containing paleo-Indian assemblages are being excavated by a crew of University of Wyoming students under my direction and with the support of the American Philosophical Society. At the Kimball station (SE¼, SE¼, SE¼, Sec. 10, T28N, R65W), an Agate Basin horizon has been found overlying a cultural zone radiocarbon dated at 8890 B.C. (10,850 ± 550 B.P., Isotopes Inc.). This early deposit contains a type of projectile point for which the name Hell Gap is proposed (Fig. 1). H. M. Wormington, who has given valuable technical aid throughout the project, describes the point type as:

> a lanceolate form, reminiscent of the Agate Basin type, yet different enough to be regarded as a separate point type. Of the six whole and fragmentary points recovered, three have so marked a basal constriction that they may be considered as essentially stemmed. Bases are straight or slightly convex. Cross sections range from relatively thin ovals to almost diamond-shaped. Flaking was by carefully controlled percussion. Pronounced basal grinding is present along the constricted portion. Size range of whole points is from 60 to 88 mm.

For purposes of comparison, plastic casts of a Hell Gap point may be obtained from the Denver Museum of Natural History.

The Warrick station (NW¼, SE¼, SE¼, Sec. 10,, T28N, R65W) lies within the same valley but several hundred yards southeast from the Kimball excavations. At the Warrick site there is a highly productive Agate Basin horizon but no well-defined Hell Gap level. In a lower cultural horizon which appears to correlate with the Hell Gap stratum at the Kimball site was found a fragmentary point which has the general outline, thin cross section, and fine flaking of a Folsom point, but which is unfluted. The radiocarbon date of 8820 B.C. (10,780 B.P.±375) for Folsom at the Lindenmeier site (Haynes and Agogino 1960) and the Hell Gap date are essentially compatible.

Geological investigations of the Hell Gap area are being conducted by Vance Haynes. Preliminary work reveals that a loess sequence containing paleosols and disconformities overlies gravels and silts that presumably rest on bedrock. A marked erosional unconformity and paleosol within the loess sequence is interpreted as representing Two Creeks time. This is supported by the radiocarbon date of 8890 B.C. from the Hell Gap occupation level which rests on the unconformity. Other pertinent Pleistocene and Recent climatic events are believed to be represented in the stratigraphy and geomorphology of the Hell Gap area.

Points of the Hell Gap type, although not previously defined, have been noted as occurring as isolated finds in Canada and various parts of the United States. They are a minor component in the Russell A. Johnston collection, gathered near Cereal in southern Alberta from blowouts which also yielded Agate Basin points, artifacts of the Cody Complex, and Alberta points. The latter resemble Scottsbluff, but are wider and longer with more pronounced stems and rounded bases.

Few Hell Gap points have been recorded from Montana and Idaho, but such points are relatively common in eastern sections of Wyoming and Colorado and can be occasionally found in the central and western parts of these states as well. Hell Gap points were noted in the surface collections of Merrill Potter, Earl White, and James Duguid of Wyoming, and among the artifacts collected by Bert Mountain and the late Perry Andersen of Colorado.

In New Mexico, points typologically similar to Hell Gap are referred to as J-points by local collectors. J-points differ from Hell Gap points by having greater body to stem width (although there is considerable overlap) and a tendency to unground lateral edges.

Fred Wendorf and Tully H. Thomas (1951: 108–9) report finding a point of Hell Gap type in an erosional blowout that also produced Folsom material near Concho, Arizona (Wendorf and Thomas 1951, Fig. 47). Since Folsom-Hell Gap material can only be found in this region in blowouts that cut into pre-altithermal strata, Wendorf (Wendorf and Thomas 1951: 109) suggests that this paleo-Indian occupation probably preceded the erosional cycle which is attributed to the post-glacial optimum. This Altithermal erosional cycle is believed to have commenced about 5000 B.C. giving a minimum date for Folsom-Hell Gap material in the region.

Lake Mohave points from southern California are generally cruder but are reminiscent in outline of Hell Gap material. Lake Mohave points are found in mixed

surface association with Pinto Basin, Silver Lake, and occasionally Plainview-like artifacts along ancient beach terraces of Pleistocene Lake Mohave. Ernst Antevs (1952: 23–9) associates these artifacts with the closing stages of the Provo Pluvial and estimates an age of 7000 B.C. for these occupational levels. Malcolm J. Rogers (1939), however, believes that the age of Lake Mohave and associated points may be more recent. It now appears that additional geological-archaeological research must be undertaken before this discrepancy in ages can be resolved.

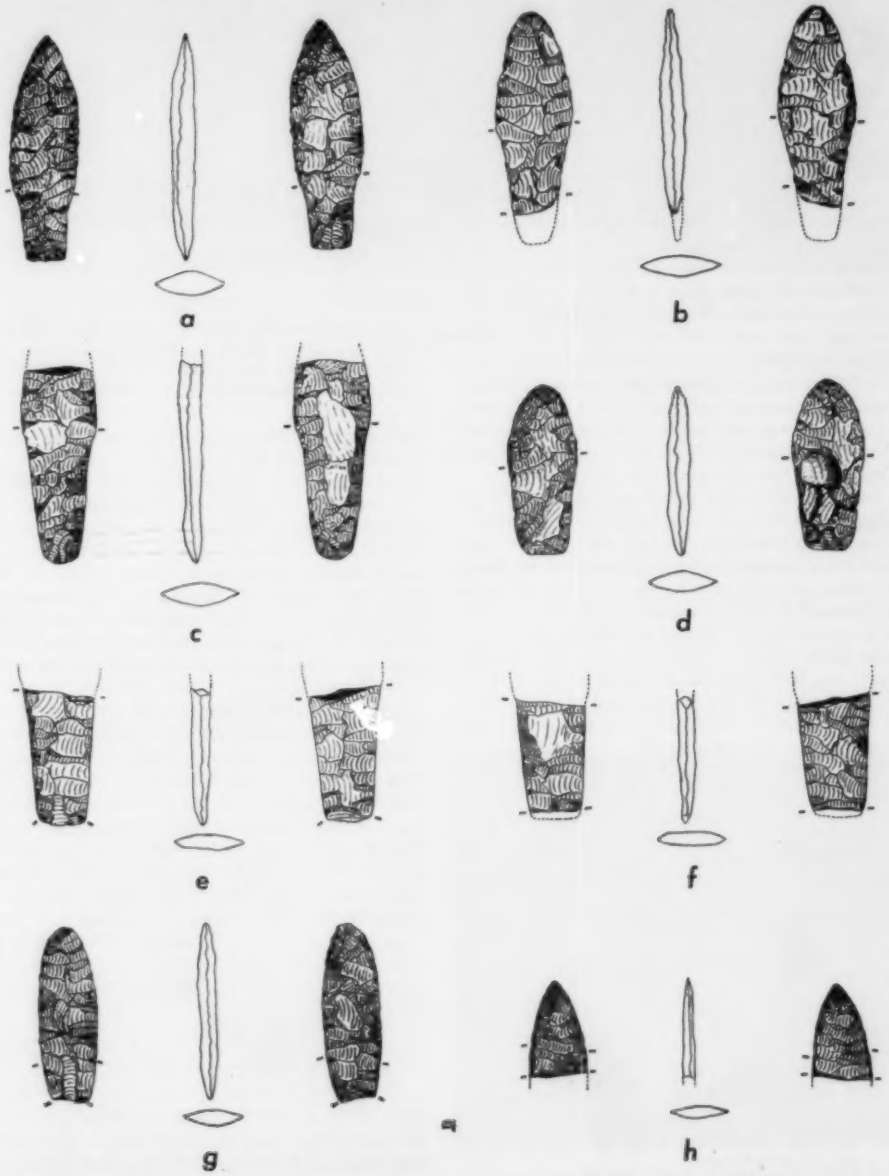

Fig. 1 [Agogino]. Points from the Hell Gap Valley, Wyoming. *a–f*, Hell Gap points; *g*, Agate Basin point; *h*, possibly an unfluted Folsom point. Lateral edge grinding is indicated by dashes.

East of the High Plains are regional concentrations of Hell Gap material known almost completely from surface collections. Several collectors in the vicinity of Glendale, southwest Iowa, have found Hell Gap point types, usually in blowouts also containing such point types as Agate Basin, Folsom, and Meserve.

Hell Gap points have been compared with points from Nebo Hill sites near Kansas City, Missouri (Shippee 1948). However, Nebo Hill points are longer, thicker, cruder, and frequently narrower than points from Hell Gap. In addition some Nebo Hill stems expand at the base, and most lack lateral edge grinding. Eastern points more typologically compatible with Hell Gap are found at the Sawmill site, central Ohio. This material, surface collected by George Arthur Smith of the Fireland Museum, contains points similar to Agate Basin and Hell Gap (Smith 1960). The Sawmill site has been tentatively assigned to the early Archaic, a term that today has little chronological meaning, since it describes a broad lithic tradition rather than a particular time period.

Ancient sites sometimes attributed to the Archaic (Willey and Phillips 1955) such as Danger Cave, Modoc Rock Shelter, and the Simonsen site overlap in time with many conventional paleo-Indian cultures. It now appears that the time sequence concept of paleo-Indian followed by Archaic may not be valid, and that we should think in terms of different traditions rather than stages.

Since Hell Gap points have been largely known from surface collections, they have been rarely mentioned in archaeological literature. Because they are well-made lanceolate forms flaked by percussion, many have thought this point type old; because they are stemmed, others have assigned them to a relatively recent age. Collectors in Wyoming and Colorado often refer to them as elephant points since they have been frequently found in surface association with the remains of proboscidians. By contrast, in New Mexico the typologically similar J-point has been considered relatively recent, and perhaps associated with the San Jose complex.

Today the Hell Gap point with radiocarbon age of nearly 9000 years B.C. must be considered one of the New World's oldest dated point types. The Hell Gap site is large and relatively rich in cultural material, and with continued research more of the non-projectile lithic complex will eventually be known. In the meantime every effort should be made to trace the distribution of this point style in both time and space.

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THE SHORT-NOSED GOD FROM THE EMMONS SITE, ILLINOIS

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Abstract

A copper-covered, wooden, human-effigy mask from a burial in a site of the Spoon River focus of Late Mississippi, about 1200–1400, probably was a rattle much like the specimen from Mound C, Etowah, Georgia.

ON JUNE 25, 1958, Merrill Emmons found a copper-covered, wooden, human-head effigy associated with a cemetery burial on his farm in central Illinois (Fig. 1). The cemetery is located in the southeast quarter of the southwest quarter of Section 19 in Kerton Township, Fulton County, Illinois. It is on the upper slope of a loess-covered bluff which faces east toward the Illinois River. In the fill of the cemetery are Middle Mississippian, Maples Mills, and possibly late Weaver sherds. Several burial mounds and a depressed area are higher up on the bluff slope. Only one of these mounds has been explored to date. This contained a multiple bundle burial, some flexed burials, a late Black Sand or early Morton sherd, and a Middle Mississippian vessel which was associated with an intrusive infant burial. Burials have been reported from the lower slope of the bluff according to S. E. McDonald of Elmwood, Illinois, indicating the presence of more cemetery groups. A Middle Mississippian village is located nearby, on the bottomlands in the southwest quarter of the northeast quarter of Section 30, which seems to date around late Old Village times or soon after. Other Middle Mississippian components may also be represented at this site. In addition, Weaver and Black Sand components are present in the village. Upon the next bluff to the south are Red Ocher, Maples Mills, and Middle Mississippian burials. In the fill of one mound on this bluff was found a typical example of a long-nosed god miniature made of conch shell (Fig. 2).

Testing has indicated that the Emmons cemetery is about 50 by 50 feet in extent. A total of 54 extended burials has been found as of September 13, 1958. Emmons says that 52 of these were oriented with the skulls to the south and two were oriented so that the skulls were to the west. The average depth of the graves has been about

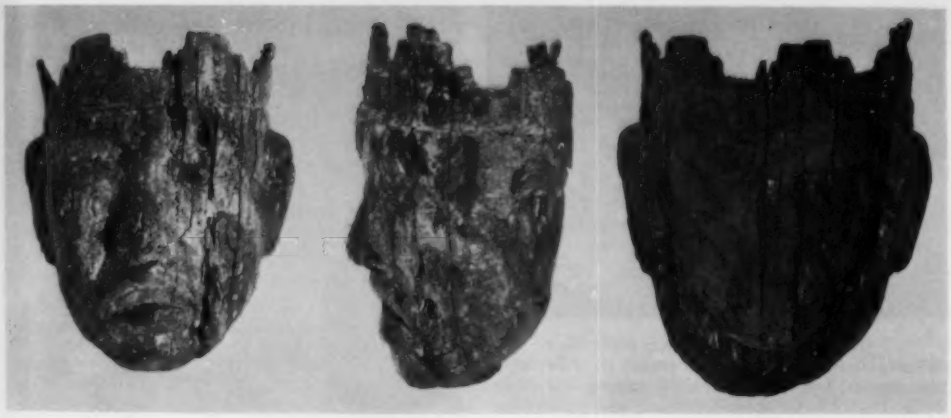

FIG. 1 [GRIFFIN AND MORSE]. Front, side, and rear views of the wooden "rattle" from Burial 31, Emmons site, Fulton County, Illinois. Height, 11.9 cm.

30 inches below the present ground surface. A considerable amount of material, for Fulton County, has been found with the 54 burials. Burial 31, the richest and most interesting find made to date, was located approximately in the center of the cemetery. Georg Neumann, Indiana University, identified the skeleton as that of a male, 46 years of age, and 5 feet 6¼ inches tall. There is pronounced osteoporosis of all vertebrae according to Dr. Dan Morse of Peoria, Illinois. The individual was extended on the back with the head toward the south in a rectangular pit which measured 6 by 2.5 feet. The base of the grave was 40 inches below the present ground surface. The copper finds have left traces on the skeletal remains and their positions are easily checked.

The copper-covered, wooden, human-head effigy was face-up, lying upon the distal part of the left clavical and upon the upper part of the sternum and parts of the first few left ribs. The chin of the artifact was oriented toward the skull of Burial 31. The maximum length of the effigy is 11.9 cm., maximum width is 9.9 cm., and maximum depth is 5.5 cm. The artifact varies from 0.4 to 0.9 cm. in thickness. It is hollowed out in the back (thus, shield-shaped) with the cutting marks clearly visible on the interior surface. There are five perforations present; one is just above and one just below each ear, and one is just beneath the center of the chin.

The exterior surface was copper-covered, though now only a green stain is present over most of the surface. There seems to be a painted "forked eye" design over each eye. The design, in each case, covers the area between the eyebrow and the nose, with extensions to the corner of the mouth and to the base of the ear lobe. A terraced headdress is set back somewhat, rather than merely being delimited by an incised line or a band. There are no pupils in the diamond to oval-shaped eyes. The mouth is open, with the corners of the mouth drawn down. The lips are full, and there are no teeth present. The eye itself is copper-covered but there are no remnants of copper beneath the white design. A spectographic qualitative analysis of the white substance was made by G. E. Mortimer, courtesy of the Research Department, Caterpillar Tractor Co., Peoria, Illinois. The principal metal is lead, the minor one, magnesium. Trace metals are Ca, Cu, Sj, Al, Ti, P, and Ag. Barely detectable metals are Na, K, Fe, Mn, Mo, V, and Sb.

Scattered equi-distant on a diagonal line from the "mask" to about the central part of the lower-most right ribs were four conch shell pendants, identified as *Busycon contrarium* by Henry van der Schalie, Museum of Zoology, University of Michigan (Fig. 3, left). They vary in length from 4.3 to 8.8 cm. and all are deeply grooved in the canal. A copper-covered wooden ear disc lay at each ear. These are slightly oblong (4.8 by 5.2 cm.) with an average diameter of 0.2 cm. for the central perforations (Fig. 4,

FIG. 2 [GRIFFIN AND MORSE]. Small shell mask of the "Long-Nosed God" from near the Emmons cemetery. Height 2.8 cm.

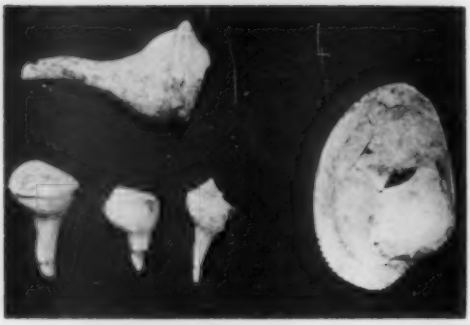

Fig. 3 [Griffin and Morse]. Four small marine shell pendants (left) and shell spoon (right) from Burial 31, Emmons site. Largest pendant is 8.8 cm. long.

left). Just south of the skull were two shell-tempered pottery vessels and a shell spoon (*Venus mercenaria*, identified by van der Schalie). A St. Clair Plain bowl (17.5 by 6 by 0.5–0.7 cm.) has a slightly incurved rim, a bowl shape, and is mainly plain with occasional patches of cord-marking on the exterior surface. A Cahokia Red-filmed vessel is an incurved-rim, effigy bowl (15 by 2 by 9.2 cm.), red-filmed internally and externally, and with both head and tail appendages broken off before burial. The shell spoon (9.7 by 6.7 cm.) was inside the upper vessel. It has small serrations on the handle and on part of the ground-down hinge area (Fig. 3, right).

A Cahokia side-notched projectile point of white chert (3 cm. long) was found just over the left elbow. A crude flake knife (7 by 3 cm.), used along one edge, was beneath the right wrist. Between the distal ends of the femurs were three objects. Two are copper-covered hard limestone ear spools of the pulley type (Fig. 4, right). The maximum diameter of the outside discs is 5.4 cm., maximum diameter of the inside discs is 3.3 cm., maximum thickness is 1.6 cm., and the perforations are 1.5 cm. in diameter. The outer face of each is slightly concave. The third object may be part of a copper-covered soft limestone ear disc. The maximum diameter is 5.7 cm. and the central perforation is 2.1 cm. in diameter.

Two fragments of a thin, copper-covered, wooden object lay upon the distal part of the left femur and upon part of the left patella. The object is 10.5 cm. long with a slightly oblong central hole 5.0 cm. in diameter. It is badly warped and in a very poor state of preservation. Lying upon the outer distal left femur and outer proximal left tibia was a copper-covered wooden disc in poor preservation. The artifact is 5.1 cm. by 4.2 cm. in dimension and the central perforation is 1.2 cm. in diameter. Upon the proximal left tibia just on the main shaft, were two more fragments of a copper-covered wooden artifact. These are small (2.5 by 3.4 cm. and 1.0 by 3.3 cm.) and in a poor state of preservation. No perforations are present on either artifact.

To date, five sorts of 'masks" have been indicated for the Eastern United States in Middle Mississippian com-

Fig. 4 [Griffin and Morse]. Wooden ear spools, formerly copper-covered (left), and copper-covered limestone ear spools (right) with Burial 31, Emmons site. Diameter of limestone ear spools is 5.7 cm.

ponent sites. Associated with the final construction phase of Mound C at the Etowah site was perhaps the closest analogy to the Emmons "mask." This was a copper-covered, wooden rattle skillfully carved to represent a human face (Larson 1957). Similarities of details between the two are terracing on the crown of the head, short noses, oval to diamond-shaped eyes, absence of pupils, and the lack of ear ornaments. The Etowah rattle differed in the following features: no lower jaw, inserted shell teeth, terracing on the lower edge of the upper jaw, an incised line below the headdress, lack of a forked eye design, and the obvious function of being a rattle.

The five perforations in the Emmons "mask" could well have been used for attachment in such a way as that represented by incised shell gorgets—as a human head replica held by a warrior-priest (Moorehead 1932: 36, Fig. 15). Just what the copper-covered wooden fragments at the knee of Burial 31 represent is hard to say at the present time. They may be parts of a sort of shield commonly depicted on shell gorgets as being worn on one side, the front, or the back of the individual (Burnett 1945, Pl. 57). The presence of the pair of ear spools, however, indicates that these objects may be part of a headdress laid over the knees at the time of burial.

For some years Griffin (1946: 88–9; 1952: 95–6; 1960: 842) has been intrigued with the ceremonial, cultural, and chronological importance of the representations in Middle Mississippi culture which have been called the Long-Nosed God. Williams and Goggin (1956) have recently published an admirable survey of these representations and attempted to distinguish culturally between a Long-Nosed God horizon of the latter part of the Early Mississippi period and the developed Southern Cult of

about the middle of the Late Mississippi period. While this was an interesting effort it does not quite come off. The small shell mask attributed to Diamond Bluff, Wisconsin, by Williams and Goggin, is actually from a different area identified as the Mero site (Griffin 1960: 842) and would appear to belong to an Oneota, or Late Mississippi horizon, instead of to the Aztalan level. It can be doubted that such a neat and clear chronological separation can be accepted which seems to isolate into "horizons" what appears to be a steadily growing ceremonial complex which diffused widely throughout the Eastern United States over at least 500 years.

Larsen (1957: 11) writes:

> Admittedly, the Etowah rattle is burdened with a short nose, but it has other attributes in common with certain of the Long Nosed God representations which may weigh as heavily, diagnostically, as a nose, for example, the terraced crown.

The cultural connections between the Etowah rattles and the wooden face from Emmons are quite close. While the Emmons site was occupied for some time the cemetery is clearly part of the Spoon River focus of Late Mississippi and Burial 31, by its ceramic specimens, belongs to this cultural and temporal assignment.

On the basis of a series of dates run on Mississippi sites in Fulton County it would seem that the Emmons wooden face can be placed somewhere between A.D. 1200–1400. Eventually a more precise allocation of the Emmons cemetery and its cultural remains can be made. As a reasonable hypothesis it is suggested that the Emmons cemetery and most of the rest of the Spoon River focus is probably the prehistoric culture of a part of what later becomes known as the Illinois tribe. This suggestion has also been made by many others, and doubted by perhaps a significant number.

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A BALL COURT AT POINT OF PINES, ARIZONA*

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Abstract

A Casa Grande type ball court at the Stove Canyon site was probably constructed during the Reserve phase, A.D. 1000–1150. The only ball court in a Mogollon region, it constitutes further evidence of extensive early influence at Point of Pines from the Hohokam of the Gila Basin.

DURING the summer of 1960, the University of Arizona Archaeological Field School continued a program of excavation at Point of Pines on the San Carlos Indian Reservation in east-central Arizona. One of the sites which was excavated, the Stove Canyon site, included a ball court, a new feature for the Point of Pines area.

The Stove Canyon site (Arizona W:9:10) is situated about 9 miles northwest of the field school on Stove Creek, a tributary of Black River (Fig. 1). The site has two components. The earlier of these is a Mogollon pit house village, which may form the basis for a new phase in the Point of Pines sequence, a local equivalent of the San Francisco phase (Haury 1936, Fig. 30). The second component is characterized by a small masonry pueblo and a number of isolated masonry farmhouses, all of which can be assigned to the Reserve phase.

A majority of the pit houses, the masonry pueblo, and the farmhouses are clustered near the east end of the site, while the ball court stands somewhat apart near the west end. Prior to excavation, the court was marked by a large oval depression ringed by a quantity of large basalt boulders. The depression was oriented in a general north-south direction.

Although the ball court at Point of Pines is far from the center of Southwestern court distribution, the Hohokam area of southern Arizona, its discovery came as no great surprise. It is only one more item in a long list of traits including such specific items as pottery, stone bowls, palettes, shell artifacts, and cremations which indicate a considerable amount of trade with and influence from the Hohokam.

Initial excavations in the court consisted of two east-west trenches through the shorter dimension of the depression (Fig. 2). One of these was placed slightly off center to the south and the other well inside the court, but near the north end. In both of the trenches, a floor was encountered at a depth of 25 cm. near the edges of the court. The floor sloped gradually inward to the center, where it was 50 cm. below the surface of the ground. The floor consisted of a smooth, white to yellow lava, indicating that the court had been excavated into the soft, weathered upper part of native bedrock. Excavating the court into bedrock would have proved no great problem for the builders. It was noticed during the excavation of the pit houses at the site, which were also cut into bed-

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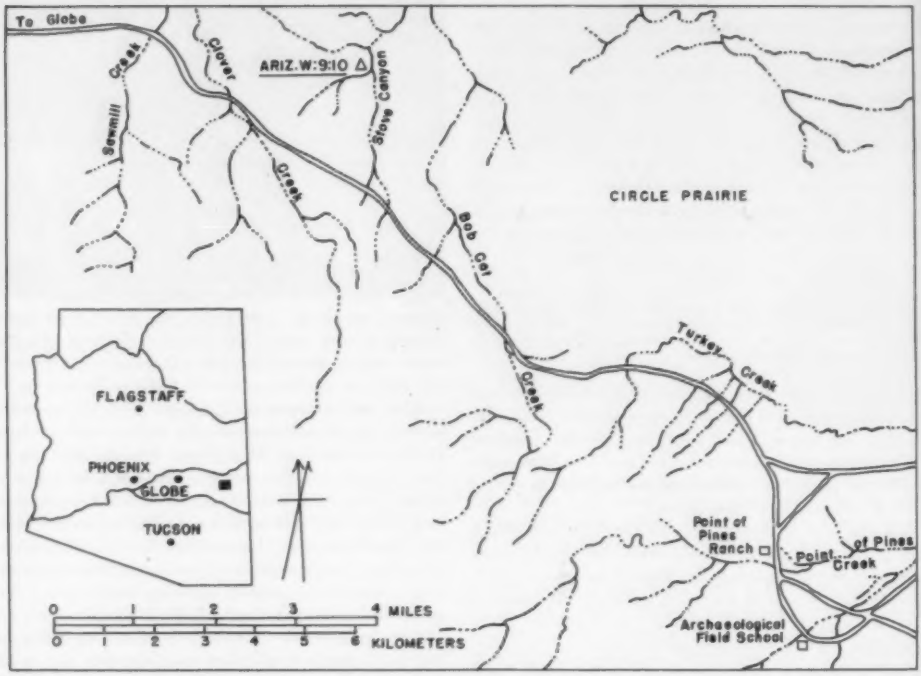

FIG. 1 [JOHNSON]. Map of the Point of Pines region showing the Stove Canyon site (Arizona W:9:10) in relation to the University of Arizona Archaeological Field School. Adapted from a map drawn by R. F. Burgh.

rock, that the rock attains the consistency of putty on contact with water.

Both of the initial trenches were dug through the line of boulders which encircled the depression (Fig. 2), and an attempt was made to determine whether or not the boulders represented the remains of a masonry wall. It was impossible to determine any pattern in the placement of the boulders, and consequently it is assumed that rather than representing a wall, they were simply rocks cleared from the depression and placed around its edges before the builders began the excavation for the court. The area of the site, in which the court is situated, is today covered with boulders of the same type, so some clearing was undoubtedly necessary.

The next step in the excavation of the court was to dig right-angle extensions of the initial east-west trenches to the north. In both cases, the trenches followed the bedrock floor. The extension of the trench near the center disclosed a stone set into the floor representing a center marker. The stone, which was a metate fragment, was set in a shallow hole in the floor measuring 15 cm. in diameter and 5 cm. in depth. A single brownware sherd was found in the hole below the metate fragment. A second hole was present in the floor immediately north of the first. The dimensions were the same as the first, and this may represent the hole in which the center marker was originally placed, the marker having been moved at some later date for an unknown reason. The center marker was some 50 cm. closer to the south end of the court than to the north.

The right-angle extension of the trench near the north end of the ball court, which was carried to the end of the court, disclosed an extensive series of rodent burrows. The burrows had quite thoroughly disturbed the end of the court, and had erased any trace of an entrance or end unit, if one was originally present. While this trench was being excavated, and an attempt was being made to work out the end features, a second right-angle extension of the initial east-west trench near the center of the court was dug. This extension followed the floor into the south end of the court, where, no rodent activity was present, and where it was possible to distinguish an end unit (Fig. 2). The end unit or entrance at the south end of the ball court consisted of a shallow trench, cut into bedrock, which measured 90 cm. in width and 2 m. in length. The trench began inside the end of the court and extended beyond the end to the south. Although a careful search was made at each end of the court, no end markers were found.

The final step in the excavation of the ball court consisted of digging two large trenches, between the initial east-west trenches, from well outside the edge to

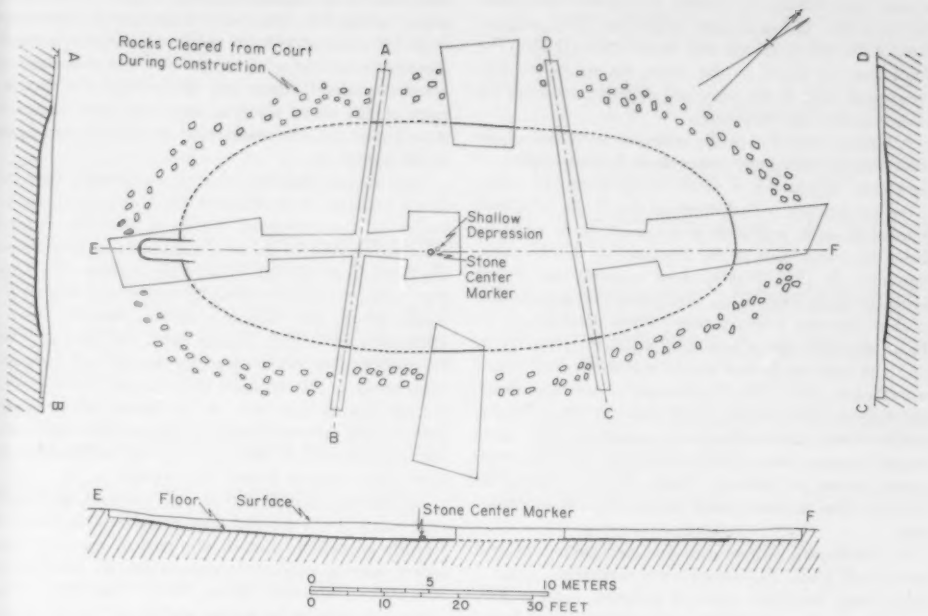

FIG. 2 [JOHNSON]. Plan and sections of the ball court at the Stove Canyon site (Arizona W:9:10). Drawn by R. F. Burgh.

a point just beyond the edge inside the court. Both of these trenches were dug in hopes of finding some pre-existing archaeological feature through which the ball court had been cut, or some feature which had been dug through the ball court. It was obvious by the time these trenches were excavated that dating the court was going to be a problem, and it was hoped that some pre- or post-court feature could be located which would aid in this problem. Unfortunately, neither of the trenches disclosed features of these types, and little more information was added than a closer delimitation of the edges of the court.

In summary, the ball court at the Stove Canyon site consisted of an oval playing floor cut into the local lava bedrock which measured 23.5 m. in length by 9.75 m. in width. The center marker was a metate fragment set in the floor of the court. The only entrance or end unit which could be defined was at the south end of the court, and this measured 90 cm. in width and 2 m. in length. End markers were not found. The court was oriented 45 degrees east of north.

One of the major problems concerned with the ball court at Stove Canyon is that of assigning dates. The earlier of the two components at the site probably dates between [illegible]0 and 900 (Haury 1936: 117), and the later Pueblo occupation between 1000 and 1150 (Olson 1960: 185). As ball courts were being constructed in the Hohokam area during this entire time span (Johnson and Wasley 1961), presumably the one at Point of Pines could be associated with either component.

The maximum depth of deposit in the court was only 50 cm., and this material was all deposited by water action. Consequently, no attempt was made to separate fill from floor artifacts. A total of 388 sherds was obtained from the court. Unfortunately, for the solution of the dating problem, 353 of these were Alma Plain, a type having such a long time span as to be essentially unusable for close temporal placement. Twelve more sherds were redware which also was made over a long period of time.

Five sherds with various surface texturing variations also came from the court. This group includes Reserve Indented Corrugated, Tularosa Patterned Corrugated, Pine Flat Neck Corrugated, and an unidentified neck corrugated variety. Both Reserve Indented Corrugated and Tularosa Patterned Corrugated are first found in the Point of Pines area during the Reserve phase. The types continued through most of the remaining phases in the local sequence (Olson 1960: 197). Pine Flat Neck Corrugated occurs first in the Nantack phase, after 900 at Point of Pines, and continues into the Reserve phase (Breternitz 1959: 26; Olson 1960: 197). These three types would seem to indicate that the ball court could not have been filled before the Reserve phase occupation of the site.

A single painted sherd was found in the large trench through the east edge of the court. The sherd, which

is small and difficult to identify, is probably Santa Cruz Red-on-buff, a Hohokam type which has been assigned dates of 700–900 (Gladwin and others 1937: 212–20). The sherd was not found in the court, but in the boulder strewn area east of the edge, and probably pre-dates the construction of the ball court.

A further indication of the temporal placement of the Stove Canyon ball court comes from a consideration of the known distribution of courts in the Southwest. Prior to the excavations at Snaketown in the 1930's, large oval depressions with surrounding ridges of earth were reported for many years in the literature on Southwestern prehistory. In 1918, Pinkley drew together the various reports on these depressions, and found that speculations on their function varied greatly. These speculations included assumed uses as reservoirs, wells, threshing floors, corrals to hold stock, dew ponds, and ceremonial chambers (Pinkley 1935: 385). On the basis of test excavations, accomplished in 1918, in a ball court at Casa Grande, Pinkley (1935: 388) offered the suggestion that these unusual features were actually gathering places for ceremonies, games, or festivals. Despite Pinkley's efforts the reservoir idea persisted until the excavations at Snaketown.

At Snaketown, where the first recognition of ball courts took place, two courts were excavated. Court 1 was a large structure, oriented east-west, with a floor measuring 56.25 m. by 18.75 m. Stone markers were found at each end; a stone buried beneath the floor was the center marker. End units were large caliche extensions at either end of the court. Sherds found during the excavation of Court 1 indicated that it was first constructed during the Gila Butte phase. Later additions were made during the Santa Cruz phase and during the Santa Cruz–Sacaton transition, or during the early part of the Sacaton phase. The name Snaketown was assigned to courts of this type (Gladwin and others 1937: 36–41, Pl. 8, Fig. 11).

Court 2 at Snaketown was much smaller and was oriented north-south. It consisted of an oval playing floor measuring 22.7 m. by 10.6 m. Markers were again present at the ends, and in the center of the court. At the north end, a narrow extension of the floor was identified as an entrance. A similar feature was probably present at the south end, although it could not be traced. Luckily, sherds were again found in association, and these indicated that Court 2 was constructed during the Sacaton phase occupation of the site. Court 2 was probably constructed after the final enlargement of Court 1. Ball courts with features similar to those of Court 2 at Snaketown were given the name Casa Grande type, due to their apparent later date, and due to the fact that the court tested by Pinkley at Casa Grande was of this type (Gladwin and others 1937: 41–3, Pl. 10, Fig. 13).

It is apparent from the above discussion, that the ball court at the Stove Canyon site typologically belongs in the Casa Grande category. Although the orientation of the court varies considerably from true north, this is also the case for a number of other courts in the Southwest. In the Gila Bend area, Casa Grande type courts ranged in orientation from northwest-southeast to northeast-southwest, and one court of this type was even oriented east-west (Johnson and Wasley 1961). Other features of the Stove Canyon court are quite similar to those known for other excavated Casa Grande type courts in the Southwest.

The known distribution of Casa Grande type ball courts (Arizona State Museum files) indicates that they center in the Hohokam region of southern Arizona, especially in the Gila Basin. Other courts are found along the Santa Cruz and San Pedro river drainages. A northern extension of Casa Grande type courts follows the Verde River into the area about Flagstaff, Arizona (Schroeder 1940: 51). To the west, the Painted Rocks Reservoir in the Gila Bend area seems to mark the maximum extent in this direction (Johnson and Wasley 1961). A Casa Grande type court at San Simon village (Sayles 1945: 31–2), one near Safford (Tuohy 1960: 43–7), and the court reported in this paper at Point of Pines are the three most easterly known occurrences.

In their temporal distribution, the earliest Casa Grande type courts are in the Hohokam area, the Gila Basin. A recently excavated court of this type in the Gila Bend area is dated by associated sherds to the Gila Butte phase, 500–700 (Johnson and Wasley 1961). Casa Grande type courts continued to be constructed by the Hohokam during the following Santa Cruz and Sacaton phases and during the Classic period (Gladwin and others 1937: 44).

Casa Grande type courts are apparently not found in non-Hohokam areas until the period 900–1100. In the Flagstaff area they first appear about 1050, as a new trait in the local inventory (Schroeder 1949: 30). The court at San Simon was probably built early in the Encinas phase, or about 1000 (Sayles 1945: 32; Wheat 1955, Fig. 12).

It is unfortunate that there are not more dated ball courts in non-Hohokam areas. Despite the paucity of evidence, present data do indicate that the Southwestern ball court was first a Hohokam trait, which diffused from the Gila Basin in the period 900–1100 into non-Hohokam areas. If this is the case, the ball court at Stove Canyon must be associated with the Reserve phase occupation of the site. The earlier component at the site would seem to pre-date the spread of Casa Grande type courts from the Gila Basin.

By way of conclusion, one further item in connection with the distribution of ball courts should be mentioned. This is the mutually exclusive distribution of the ball court and a second large structure with ceremonial functions, the great kiva. For purposes of this discussion, the time period will be restricted to 900–1100, when the ball court is believed to have moved out of the Hohokam region into non-Hohokam areas. In the Mogollon area ramped, rectangular great kivas were the most common form during this and later periods of time (Olson 1960: 199–203). The Stove Canyon ball court discovery makes

Point of Pines the only Mogollon area where both great kivas and ball courts are found. As a hypothesis, it can be suggested that the reason for this mutually exclusive distribution was a differing set of religious concepts associated with each of the two types of large structures. If this was the case, Point of Pines would seem to be a Mogollon area where Hohokam influence was strong enough to introduce some of the prevailing Gila Basin concepts despite the opposition of a differing set of local ceremonial practices.

Acknowledgments. Appreciation is expressed to the following individuals and organizations for their part in the production of this report. The excavation program of the University of Arizona Archaeological Field School at Point of Pines during 1960 was supported, in part, by the National Science Foundation. The projects were carried out on land of the San Carlos Tribe, and a number of Indian laborers did much of the digging. Thanks are extended to Raymond H. Thompson, acting director of the Field School, and to the students who participated in the excavations. Emil W. Haury, William W. Wasley, and Thompson read the manuscript and offered suggestions for its improvement.

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Arizona State Museum
Tucson, Ariz.
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REVIEWS

Edited by Donald Collier

Post-Cranial Skeletal Characters of Bison *and* Bos. Stanley J. Olsen. Papers of the Peabody Museum, Harvard University, Vol. 35, No. 4, Cambridge, 1960. vii + 61 pp., 24 figs. $1.75.

Archaeologists are gradually becoming more aware of the contribution that associated faunal materials can make toward a complete ecological and cultural understanding of the site or peoples being studied. They have also come to realize the two major problems involved with zoological remains recovered at sites: the identification and the interpretation of resulting data. In this volume, Olsen has attempted to provide the archaeologist with a practical aid for separating and identifying the bones of two closely related groups of mammals, the bison and the domestic cow.

The concise beginning section or "Discussion" deals with the introduction of domestic cattle into North America, the literature pertaining to early anatomical treatments of the bison, the structural relationships among bison, Brahman cattle, and domestic cattle, and the problems involved in identifying their bones. In the second, succinct section covering the "Skeletal Characters of *Bison* and *Bos*," the major diagnostic bones are described in relation to the characteristics which would aid in separating them. Statements here continually refer the reader to the figures which serve as a visual supplement to the text. These black-and-white drawings are excellent, and the use of heavy dash lines to designate the distinguishing structures, shapes and proportions of the bones of the three species considered makes the publication especially valuable.

For the archaeologist, however, to whom the theme of this volume is directed, use of the reference may be limited. First, zoological terminology, although necessary for description, might prove to be a handicap to those with little or no training in the field of zoology or osteology. Careful study of the illustrations would help overcome this difficulty, but both text and illustrations are necessary for exacting determinations. Secondly, Olsen has clearly pointed out the major difficulty:

> As stated at the beginning of this summary, most of the morphological differences found in these 3 compared forms are a matter of *degree of variation* rather than radical, easily seen characters and it is necessary to have at least one skeleton of each of the 3 forms at hand in order to make the final decisive comparisons.

The vertebrate zoologist specializing in the field of osteology, and who is working with faunal remains from archaeological sites, will find this reference invaluable. Few archaeologists have sufficient zoological training and experience to enable them to cope with the problems involved in faunal identification. Even with some background in zoology, the majority of archaeologists would probably have neither the time nor inclination for such detailed work, and this volume would serve as only a preliminary or superficial aid in making identifications.

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A Report on a Bluff Shelter in Northeastern Oklahoma (DI–47). David A. Baerreis and Joan E. Freeman. Archives of Archaeology, No. 1, Society for American Archaeology and University of Wisconsin Press, Madison, 1960. 334 pp., 42 figs., 86 pls. on 5 double-sided cards. $1.50.

An Archaeological Report on a Cave Deposit in Northeastern Oklahoma (DI–30). Joan E. Freeman. Archives of Archaeology, No. 2, Society for American Archaeology and University of Wisconsin Press, Madison, 1960. 104 pp., 27 figs., 29 pls. on 2 double-sided cards. $0.75.

The above reports are Numbers 1 and 2 of the newly established *Archives of Archaeology* published jointly by the Society for American Archaeology and the University of Wisconsin Press. They represent a new venture in the publication of archaeological data by the use of microcards. This method provides an economical way to publish a huge volume of facts, figures, tables, charts, and pictures which would normally be prohibited because of printing costs. These two reports, comprising no less than 438 pages are contained upon seven glossy 3-by-5-inch cards, each complete with label and file data.

I examined the microcards with a Kodagraph Microprint Reader, Model A, which projects each page at normal size upon a viewing screen. The cards and viewer are easy to operate, and one can shift from one page to another quickly, a distinct advantage because of the many illustrations and tables. The text is easy to read although occasional uneveness in the original typing is evident. A figure number is sometimes hard to read, especially where it occurs near the periphery of the page, because the margins of the page image are likely to be slightly out of focus at times; this necessitates minor adjustments as you move from page to page. In paper No. 1, page 272 is missing.

In the case of photographs, many are too dark to be of maximum value since the surface features are not evident. In some of the projectile points, only the outlines are available, for the darkness obscures all of the chipping. Many of the decorated pot sherds in which the punctate or incised designs are important fail to show these features. The line drawings, on the other hand, are excellent and show every feature that was intended. Additional experience and care in selection of photographs for

microcard use will certainly improve these defects, as evidenced by the fact that specific examples are quite satisfactory.

Both sites reported on are represented by rock shelters located in Woodward Hollow, Delaware County, Oklahoma, in the northeastern corner of the state. The sites are within one mile of each other, and the excavations represent salvage work conducted by the Works Progress Administration during the period from 1937 to 1940 for the Grand Lake Reservoir. The fieldwork was under the immediate direction of David A. Baerreis. It is a pleasure to see site reports on some of these early WPA excavations. The two reports supplement each other in that their major contribution is in presenting basic facts regarding the Neosho focus, known otherwise only from summary data.

Paper No. 1, by Baerreis and Freeman, presents an exhaustive report upon the excavations, features and artifacts recovered from DI–47. Detailed information is given for all artifacts recovered at the site, arranged in terms of categories under chipped stone, ground stone, bone, shell, and pottery. This is followed by a discussion of the Neosho focus ceramic complex and an interpretation of the site. Appendices by John T. Curtis (Charred Plant Material from Site DI–47) and Aaron Elkins (Skeletal Material from DI–47) add considerable value to the report.

A major section is devoted to studies of projectile points and pottery, the two most abundant artifacts from the site. The authors recognize several established projectile point types and provide descriptive data for three new types: Cooper, Cupp, and Smith points. The pottery discussion is concerned primarily with the description and identification of the types Woodward Plain and Neosho Punctate, plus comments upon the general problem of shell-tempered wares in eastern Oklahoma.

The authors recognize essentially a Woodland occupation followed by a later Neosho focus occupation at the site. There are a few Caddoan sherds present, but they cannot be identified as to either Gibson or Fulton aspect types. As intrusions, they appear to be aligned with the later Neosho focus pottery wares rather than the earlier Woodland types.

The second paper by Freeman on DI–30, No. 2 in the series, reports on a smaller site that was predominantly occupied by the Neosho focus peoples. A few traits, not represented at DI–47, add to our knowledge of this focus. An appendix by Aaron Elkins on the Skeletal Material from DI–30 completes the report.

These two reports present a detailed analysis of materials found at two sites in northeastern Oklahoma. They are not intended for the general reader, but are useful to the specialist who wants exact and detailed data about what was found at DI–47 and DI–30. I believe this presentation of data is one of the purposes of the *Archives of Archaeology*, and, if this is true, these first examples measure up to this goal.

I hope, however, that condensed summaries will be published elsewhere in order to reach a wider and less specialized audience.

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Náⁿza, the Ponca Fort. W. RAYMOND WOOD. Archives of Archaeology, No. 3, Society for American Archaeology and University of Wisconsin Press, Madison, 1960. 163 pp., 23 figs., 7 pls. on 3 double-sided cards. $1.00.

This monograph provides a good example of the effective use of micro-card publication to rescue valuable data which might not become available through more conventional means. The study reports the results of field excavations in northeastern Nebraska, carried out in 1936 and 1937, by a WPA party, supervised by the late Perry Newell, under the general direction of Earl H. Bell, Department of Sociology, University of Nebraska. The laboratory work was first undertaken as research when Wood was a graduate student at Nebraska in 1953. It has been augmented and substantially improved by revision just prior to publication.

Using special techniques, described briefly in the Appendix, Wood has re-worked Newell's journal notes and reconstructed the field work. The artifact collection was analyzed and a summary ethnohistory was developed from early maps and travel accounts. Synthesis of these data permitted the identification of two major occupations of the site. Component A, the earlier, is ascribed to an Aksarben occupation, about A.D. 1300–1500 largely on the basis of ceramic criteria. Component B is identified as a Ponca occupation of 1790–1800. This first recognition of a documented Ponca village emphasizes ethnohistoric data as well as archaeology. The presence of substantial amounts of a pottery called Stanley ware are believed to demonstrate contacts with contemporary Arikara farther up the Missouri.

The analytical methods employed expose considerable gaps in the existing data. This fact, in turn, may explain why no clear picture of the Ponca occupation emerges. The author's suggestion for further work at the site seems well taken. Wood, in self-criticism, concludes:

> The goal of this study, to provide a sound base from which to extend the history of the Ponca back in time through the application of the direct historical approach does not appear to have been successful. The clues for pursuing Ponca prehistory may be in hand, but they are not yet clear.

I cannot agree with this statement. The task which the author accepted was not an easy one. In my opinion, this application by Wood of the direct historical approach deserves commendation as a job well done.

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An Introduction to Kansas Archeology. Waldo R. Wedel. Bureau of American Ethnology, Bulletin 174, Smithsonian Institution, Washington, 1959. xvii + 723 pp., 109 figs., 97 pls. $3.00.

Wedel has produced the most important book on Plains archaeology since Strong's *Introduction to Nebraska Archeology*. Using the direct historic approach, he presents a well-rounded account of the archaeology of Kansas based upon his investigations of 1932 to 1940. A description of the skeletal remains by T. D. Stewart is included in the appendix. The volume, copiously illustrated with maps, line drawings, and photographs of exceptionally fine quality, is well organized, well written, and appears to be singularly free of errors for a work of such magnitude.

After discussing the environmental setting and the historical background, Wedel documents the appearance on the scene of the several tribes: Kansa, Osage, Wichita, Plains Apache, refugee Pueblo groups, Comanche, Kiowa, Kiowa Apache, Arapaho, and Cheyenne. The enigmatic Padouca are identifiable first as the Apache and later as the Comanche. Presentation of archaeological data begins with a summary of work done prior to that of Wedel and continues in the form of a regionally organized series of site reports. This is followed by data gleaned from direct observation of such manifestations as quarries, petroglyphs, unpublished private collections, and other sources of information. Finally, there are summaries of the characteristics of the several culture complexes, a discussion of their temporal relationships, extensive interpretations, and concise conclusions.

Each site investigated by Wedel is treated in detail in regard to methods of excavation, nature of features, and descriptions and classifications of specimens. In northeastern Kansas his principal objective was to identify the Kansa archaeologically. He admits partial defeat in this endeavor because of the paucity of objects of aboriginal manufacture in documented sites. The area investigated at the Doniphan site turned out to be largely attributable to a late prehistoric occupation which is identified as the Nebraska aspect. Better results were obtained at the Fanning site where he found larger amounts of Oneota and Lower Loup pottery associated with European trade goods. At the Kansa Village near Manhattan, a site known to have been occupied into the early 19th century, he found little that could lead him back into the prehistory of that tribe. Several other sites in northeastern Kansas were investigated. These pertain to Central Plains, Woodland, and Hopewellian manifestations. Surface collections indicate the presence of paleo-Indian and Archaic manifestations.

In central Kansas his efforts were directed largely toward the definition of the Great Bend aspect through the excavation of a series of sites in the drainage of the Arkansas River. Apart from valuable data presented on the nature of the complex as a whole, he reports fragments of chain mail of Spanish origin at the Thompson site and the repeated association of sherds of Pueblo origin at several sites.

For western Kansas he reports such stratified sites as Pottorff where he found three occupations. At the bottom was an occupation marked by refuse but devoid of diagnostic artifacts. Above this was a Plains Woodland occupation. Near the surface he found two earthlodges associated with Upper Republican artifacts. An important contribution is his report on the excavations adjacent to the Scott County Pueblo that he identifies as El Cuartelejo, the site occupied by refugee Pueblo groups from the Southwest in the late 17th and early 18th centuries. His investigations revealed a basically Plains complex identified as Dismal River with a minority of associated Pueblo traits.

Summaries of his observations on quarries and petroglyphs are followed by interpretations of unpublished data from such sites as the burial pit and nearby earth lodge remains excavated by Whiteford near Salina, and from other sites and collections in various places. A newly discovered manifestation called the Pratt complex is tentatively defined.

The author assigns the sites to taxonomic units under the McKern classification. The Upper Mississippi phase is composed of the Oneota and White Rock aspects, the Wolf focus representing the former and the Glen Elder focus the latter. The Great Bend aspect, not assigned to a phase, is composed of the Little River and Lower Walnut foci. The Dismal River aspect, not assigned to a phase, is represented by the Scott focus. He solves the problem of classifying the complexes under the Central Plains phase by establishing the Smoky Hill aspect which he adds to the well-known Upper Republican and Nebraska aspects. Two foci, Manhattan and Saline, are assigned to Smoky Hill. The Plains Woodland phase is represented by at least one aspect, Orleans, to which the Keith focus is assigned. The Kansas City focus is assigned to the Hopewellian phase, no aspect being named. Several sites are either identified as to historic tribal affiliation or left unclassified.

In the summary of the culture complexes the author defines and compares complexes referable to paleo-Indian, Archaic, Woodland, Hopewellian, Central Plains, Great Bend, Dismal River, and Oneota. This is an especially well-organized section which gives the reader a clear conception of the various complexes and their relationships. Under "Time Perspective" he discusses the evidence for relative and absolute dating and presents a chronological table.

The culture sequence begins with scant evidence of the presence of paleo-Indian complexes, followed by the Archaic, known largely from surface collections. Some time prior to the birth of Christ the Plains Woodland phase makes its appearance and lasts until nearly A.D. 1000. Hopewellian manifestations parallel it in time. The Central Plains phase replaces Plains Woodland and Hopewellian throughout Kansas from about A.D. 1000 to 1400. In the western part of the state the phase is represented by the Upper Republican aspect, in the central part by the Smoky Hill aspect, and in the northeast by the Nebraska aspect. In south-central Kansas

the Pratt complex appears to fall between the Central Plains phase and later manifestations. Only in central Kansas is there adequate definition of the complexes representing the period between about 1400 and the arrival of Europeans. To this period belong the Lower Walnut and Little River foci of the Great Bend aspect and the Glen Elder focus of the White Rock aspect. Nothing has been defined in the west for this period and there is scanty evidence for the gap being filled by Oneota in the east. By the end of the 17th century refugee Puebloans and the Dismal River aspect appear in the western part of Kansas, and Oneota is definitely present in the east. No contemporary manifestations are known for the central part of the state. Toward the end of 18th century and the beginning of the 19th the Pawnee were in north-central Kansas at one site and the Kansa were along the Kansas River and in the northeastern corner. No archaeological manifestations can be correlated with the Comanche, Kiowa, Cheyenne, and Arapaho, who are known to have been in the western part of the state in historic times.

Stewart's treatment of the skeletal material from the Doniphan and Young sites in the appendix adds important data on the physical anthropology of the aboriginal inhabitants of the Plains.

Wedel's book fills a long-felt need in Plains archaeology and does far more than merely lay the foundation for further investigations in Kansas. The essential soundness of his interpretations and conclusions combined with the valuable data he presents make the book an important and durable source of information.

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Indian Mounds Park Archeological Site, Rice Lake, Wisconsin. LELAND COOPER. The Science Museum of the St. Paul Institute, Science Bulletin No. 6, St. Paul, 1959. iv + 50 pp., 5 figs., 10 pls., 1 map. $1.00.

In the Indian Mounds Park on the west side of Rice Lake, Wisconsin, is a group of 12 conical mounds, all that remain of a group of 51 described by Thomas in 1890–91. In this monograph, Cooper describes the excavation of one of these mounds and the artifacts found in it. Although the mound had been pitted at some time in the past, the careful excavation by the author revealed that the two pits on the floor contained bundle burials that had not been disturbed.

A number of potsherds with cord-impressed decoration were found in the mound fill. They are similar to those of the Black Duck focus in Minnesota. In direct association with the burials were some small triangular projectile points and bone tools of aboriginal manufacture and a steel spring and lead button of European origin. The association of these objects with the burials seems unquestionable, and therefore the mound is assigned to the historic horizon. After a brief review of the ethnohistoric literature of the area, the author suggests that the mounds may have been constructed by some branch of the Dakota Sioux, who were known to have been in the area in the early part of the historic period.

The report is well illustrated with plans and profile drawings as well as photographs of the mound and the artifacts. In a brief manner the author presents additional evidence supporting his thesis that the mound building pattern continued into the historic period in Wisconsin. The report also emphasizes the fortunate fact that some information may still be obtained from mounds that have previously been disturbed.

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The Archaeology of Hamilton County, Ohio. S. FREDERICK STARR. Journal of the Cincinnati Museum of Natural History, Vol. 23, No. 1, Cincinnati, 1960. 130 pp., 6 figs., 41 pls., 6 tables.

This publication presents the results of a survey of the archaeological sites within Hamilton County and the literature pertaining to the location and character of Hamilton County sites that were once identifiable but have since been destroyed through urban expansion, road construction, and other activities. The results of this survey are prefaced by a discussion of the history of archaeological investigation in Hamilton County together with a description of the topography. Sites are presented under the headings of paleo-Indian, Adena circular earthworks, ceremonial earthworks, defensive fortifications, and stone mounds. Following the site descriptions, which are presented under the above classes, is a description of sites arranged by townships within the county. The latter are not specifically included in the five-class breakdown mentioned above. A total of 295 sites are discussed, of which 148 have either been destroyed or excavated in the past.

The reported data relevant to the sites are sketchy, although this is no doubt largely a function of the availability of information extant in the older literature. When earth mounds are discussed there is an attempt to give their dimensions, placement relative to property lines, other surface features, and river systems. Occasionally the artifactual contents of the mounds will be mentioned together with an identification as to the Hopewell or Adena affiliation of the mound. Sites that have received professional attention are generally treated similarly with the addition of the history of the excavations and references to published accounts of the site. Included in many of the site descriptions are comments about the period of early European settlement in Hamilton County, as well as references to early settlers and property owners.

The author has not attempted to analyze the sample of sites nor to offer hypotheses concerning the temporal, cultural, or situational relations obtaining between them,

although occasional mention is made of similarities or differences between specific sites. It is curious that there is practically no mention of Archaic remains, as such, although several "archaic sites" are identified. Why the author did not see fit to group these together and present a section on Archaic sites, as he did with paleo-Indian materials, is not apparent.

The primary function of this publication is to gather together, in a single volume, data on the known archaeological sites within the county. In view of this it is unfortunate that more precise locations were not supplied, together with a map of the distribution of sites within the county.

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The Eastern Dispersal of Adena. WILLIAM A. RITCHIE and DON W. DRAGOO. New York State Museum and Science Service Bulletin, No. 379, Albany, 1960. 80 pp., 2 figs., 16 pls., 5 tables. $1.25.

The thesis of this paper is that Adena people who had occupied the eastern Ohio Valley during Middle Adena times fled to the East Coast and Northeast. They were driven from their homes by the intrusion of Hopewell people migrating from Illinois. I believe there is no sound evidence to support this latter proposal. The authors believe that some Adena people remained in the Ohio Valley and that these were primarily the ordinary people, for the ceremonial leaders gathered their wealth of prized possessions when they fled the Ohio Valley. One of the major values of this collaborative effort in reporting and interpretation is the presentation of the data available on the Cuylerville, Walsh, and Long Sault Island sites in New York.

The authors get off to a fast, false start when they identify, as Adena, a number of stone mound sites, such as Pollock's Hill, Linn Mound and Sheppler (excavated by Engberg not Engeberg, who only reported that it was a mound and had grit tempered pottery!). The authors apparently believe that Cyrus Thomas surveyed and excavated the Monongahela sites, but I doubt that he did, or even saw the Crall Adena mound. The only other mound securely Adena is Peters Creek, which they commendably rescue from a little known 1902 report. The sound data available in print, however, do not yet justify the interpretation of the Monongahela Valley as a significant center of Adena occupation or as a route of movement to the east. It is curious that Snow in his study of the McKees Rocks Mound found only one "typical Adena" burial. The primary burial of this mound had artifacts believed by some archaeologists to be Hopewell, and the complex as a whole for the primary and secondary mounds is not distinctively Adena.

There is no question of the striking quantity of Ohio Valley artifacts of Adena affiliation that are found in the burial grounds of these sites along Chesapeake Bay. There is, however, room for doubt that they represent a migration of people. I do not understand why Adena people should be forced out of the Ohio-Monongahela area by Hopewell when there is little evidence of the latter culture in that western Pennsylvania area. May we wait until some village sites of the peoples who made the burials are found in the Chesapeake Bay area to see if the village complex carries the same proportions of Ohio Valley raw materials? These burials and their grave goods may represent the luxury items imported from the west and buried with the local dead in the same way we explain the presence of exotic materials in Ohio Hopewell burials. If the Chesapeake Bay graves are really the remains of dispossessed Western Pennsylvanians, then their burial deposits of Ohio Valley materials would not last more than one generation. The authors have not been concerned with the local cultural complex with which their migrants merged, but this would seem to be of considerable importance.

On turning to "Adena in the Northeast" we find a very curious migration, indeed, recognized by "their considerable dispersal along major waterways, and their ultimate differential cultural assimilation into various local populations." This "evidence" for Adena migrations "comes from 19 burial components, varying greatly in size, from one or two to approximately 25 graves, distributed from New Jersey to the Canadian border, and from western New York to southern Maine." This might have been described as a population explosion! Two major routes are postulated: the first up the Allegheny River, along which they were able to move rapidly, for no one appears to have died, and up the Delaware River from the Chesapeake area (where again no deaths occurred) to the Rosenkrans site in northern New Jersey. It somehow reminds me of old elephants returning to their home area to die. There are precious few "diagnostic" Adena traits that are well represented in 19 sites called "Middlesex" by the authors. The seven "diagnostic" traits at nine or more sites are: blocked end tubular pipes at 18 sites, making them much more typical of Middlesex than they are of Adena; large or small leaf shaped blades, ten sites; rolled copper beads of various sizes, 14 sites; copper pin or awl at nine sites; *Marginella* beads at ten; cylindrical shell beads at 11 sites; red ochre in graves at ten sites. The other 27 "diagnostic" Adena traits are found at an average of four out of 19 "Middlesex" sites. There are 18 "less diagnostic" Adena traits in the "Middlesex complex" and 41 Middlesex traits not listed by Webb and others as Adena. Both lists display the same striking lack of a consistent burial complex, which is what one might expect if the Middlesex complex was composed of several discrete cultural entities separated both geographically and temporally. Using the Ritchie and Dragoo approach one could claim that various Late Archaic and Early Woodland burials in Michigan are the result of Adena people moving to Michigan. The Middlesex complex consists primarily of a blocked-end tubular pipe and a series of other burial traits common in the

north from the Great Lakes to New England during Late Archaic to Middle Woodland.

My interpretation of the Rosenkrans site is that the artifacts are almost entirely of local materials and that no one should ever confuse this burial complex with Ohio Valley Adena, although there are similarities of artifacts types. The Cuylerville site of one or two components does show a few traits which are in Adena, but not one that is Adena alone. Ritchie originally called it Point Peninsula I, which he has proclaimed as one of the sources for Adena development. Which shall it be? I am disturbed by the movement of traits and complexes between Point Peninsula I and Middlesex. The Walsh site is given in the trait list as 100% Adena (a sufficient rarity in itself) primarily on the basis of one tubular and four modified tubular pipes, yet only five Adena mounds out of approximately 200 had pipes of this form. More of them were with the two Walsh burials than have ever appeared in an Adena mound. This pipe form is a rarity and its time placement is in Late Adena and Early Ohio Hopewell.

The Kipp Island site artifacts illustrated by Carpenter, who originally proposed the Adena migration, or by Ritchie and Dragoo do not appear to me to represent the burials of a migrant group of people, but rather the product of local populations, with some trade items of rarity and value. The projectiles and pipe forms from the Kipp Island burials might be regarded as Late Middle Woodland in time. And which skeletal material in either Middlesex or Point Peninsula represents the Adena physical type? The Long Sault site is another example of a mound without a village site while near it is a village site of Point Peninsula II without burials! Ritchie's attribution of this site to Hopewell time is probably correct. Did his migrant Adenans bring along some of their victors' weapons, or were these Ohio Valley specimens really traded from the south, and then buried along with the native raw materials and forms? Very similar large blades mixed with "Late Old Copper" forms have been found at Pembroke, Ontario, on the Ottawa River. Similar forms from Killarney Bay, Ontario, have been dated close to the birth of Christ. I do not question the time position which the authors give these sites, but regard as doubtful their inferences as to the meaning of the artifact connections.

The average on the six reliable runs from the West River site, Maryland, would place the time of burials about A.D. 1. The time span of the given dates is from 351 B.C. to A.D. 255 but the other four are, 150 B.C., and A.D. 1, 9, and 75. This would be the time of Hopewell dominance in southern Ohio and in what I would call Late Adena, for I have no confidence in the Chicago dates for the Florence and Drake Mounds of A.D. 529 and 782 respectively.

One of the basic difficulties with this paper is the ready acceptance of some 243 traits as "diagnostic" of Adena in the sense that if anyone of them is present — or 25 or more — "Adena Culture" is demonstrated. There is no appreciation that Adena is a functioning complex of some 800 to 1000 years duration, spread over an area 300 miles in diameter, which participated in cultural changes and complexes of many other groups over a much wider area. The mechanisms of trade, diffusion, preservation of prized artifacts, movement of individuals from one group to another, differences in total cultural complex, association with physical types of markedly non-Adena appearance are not adequately considered in this report, particularly in regard to the northeastern sites.

The Chesapeake Bay sites may be the result of a population movement. The suggestions that the northeastern sites are the result of a migration of Adena people with "diffusion radials" I regard as unlikely.

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The Archeology of the Childersburg Site, Alabama. David L. DeJarnette and Asael T. Hansen. Notes in Anthropology, No. 6, Florida State University, Tallahassee, 1960. vi + 65 pp., 4 figs., 13 pls.

When the De Soto Commission of 1935 set out to form the best opinion then possible concerning the route of the De Soto expedition from Florida to the Mississippi River, John R. Swanton, Chairman of the Commission, concluded that the Upper Creek community of Coosa visited in 1540 by the Spanish explorer lay between the mouths of Tallasseehatchee and Talladega Creeks on the Coosa River, Talladega County, Alabama. The Alabama Museum–Work Projects Administration staff surveyed the area in 1940 and found evidence of late prehistoric aboriginal artifacts and a scattering of iron, brass, lead and glass trade artifacts at a site designated Ta–1. In 1948 limited archaeological investigation at this site was financed by a grant from the Alabama Power Company to the Alabama Museum of Natural History, and David L. DeJarnette and his party went to work in an area of concentrated midden and burial evidence. This report, based on DeJarnette's master's thesis at the University of Alabama, is the final result of the excavation.

A total of 12 burials and 95 features were found, including, among the latter, 52 midden pits, 37 post holes, four fire pits and two short trenches mostly within an area approximately 200 feet square.

The burials were rather casually flexed in ovoid pits, and had trade goods with them dated from 1700 to 1775. Aboriginal ceramics from the site corresponded to types at 18th century Ocmulgee Fields, Georgia. "Could Ta–1 have been Coosa?" DeJarnette and Hansen answer their question: "The evidence clearly suggests that the site of the community De Soto visited is somewhere else."

Several points come to mind in reading about the archaeological yield at Ta–1. The first is that here we are dealing with a people whose language we believe we know, whose customs we have heard described, who are historic Indians in the plain sight of our 18th century

forefathers. Even though the topic is summarily introduced with historical and ethnological references, the archaeological gleanings from the site at which these Indians lived yield a curiously limited picture.

The limited area of the dig, the 12 burials, and the other features, are insufficient to give a representative picture of the progressive site occupation. It is quite possible that a test a few hundred feet away could have produced evidence from 1400, 1540, or 1800. The first fact to consider is that Mississippian sites are shallow chiefly because the people, being dependent upon corn cropping for food, had to move their settlements periodically as the practice of slash-and-burn depleted the soil. The Coosa of De Soto's visit of 1540 may not even have been on the exact location of the Coosa of 1559 visited by Tristan de Luna. It most likely was not the same Coosa visited in 1567 by the party from the Juan Pardo expedition. By the time James Adair "visited Coosa between 1750 and 1760" the odds that the village of that time was identical with the village visited by De Soto are prohibitive — unless pure chance brought the settlement back to its 1540 location in the cycle of soil depletion and village removal.

Since historic-site archaeologists can identify time and cultural associations at a glance by the use of dated objects of White manufacture, investigators may as well be satisfied with the first two burials with datable trade goods and the first 10 pit features, in the absence of post-mold patterns, and move to another location for another test, and so on, test after test, in a carefully plotted, comprehensive search over a wide area. The more extensive the search, the better the chances of discovery of pertinent evidence. Since no in situ evidence has yet been seen by an archaeologist, at least the odds are increasingly favorable for one of the many field surveys now under way or planned in the southeast to produce undeniable clues of De Soto's route.

The Childersburg report is introduced by two helpful brief chapters presenting the historical and the archaeological orientation, from paleo-Indian to historic 18th century site evidence — all concisely and clearly put. The site data are also succinctly presented. The report is useful and timely, and good enough to allow me the premium of at least one constructive suggestion. Most of the 55 glass bead types are designated as if they had originated locally by giving them place names to which is added an adjective or two to describe physical appearance. Thus, for beads whose European origins and trade names are available to historical research, we have such designations as Childersburg Translucent Green Oval, Tallasseehatchee Transparent Decahedral and Talladega Angular Teardrop! Such local place-naming has been inflicted as well upon Spanish and Mexican majolica wares found elsewhere in the southeast. Ethnocentricity?

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The Dover Mound. William S. Webb and Charles E. Snow. University of Kentucky Press, Lexington, 1959. v + 72 pp., frontis, 43 figs., 7 tables. $2.50.

For three or more decades of thorough explorations and meticulous reporting, Webb and his colleagues have been making significant contributions to our knowledge of prehistory of the eastern United States. The present paper, although offered in a new and colorful format as a "separate, independent publication," maintains the old, well-established tradition of detailed factual presentation and analysis. The authors state that, "The report . . . may be considered a continuation of *Reports in Anthropology and Archaeology* and be catalogued as a special unnumbered issue of Volume IX of that series." It is an account of the exploration of a large Adena burial mound located in northern Kentucky at the southeastern edge of the town of Dover. The mound measured 120 feet in diameter (maximum dimension) and stood 20 feet above the old village floor. Work was begun in 1950 and completed in 1951.

Exploration revealed four "zones" or stages of mound construction, containing and covering a total of 55 burials. The disposition of the dead ranges from simple extended inhumations to bark-lined tombs, the latter near the top of the mound and radiocarbon-dated at about 690 B.C. Cremations were recorded at all levels in and beneath the mound.

All of the cultural remains, except the potsherds from the mound floor, were found in burial association. Copper artifacts were most numerous and appear to reflect to some degree internal cultural changes. This is demonstrated by the methods of manufacture of copper bracelets recovered from the various levels in the mound.

Snow's analysis of the skeletal remains revealed some of the tallest individuals recorded in Adena. He is to be congratulated for the meticulous work on the "multiple cremation." This "exercise" clearly demonstrates what can be done with fragmentary cremated material. On the whole, the report is well done. It is regrettable that some of the photographic reproductions are not of the best quality.

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The Bayshore Homes Site, St. Petersburg, Florida. William H. Sears. Contributions of the Florida State Museum, Social Sciences, No. 6, University of Florida, Gainesville, 1960. 38 pp., 9 figs., 3 pls. $0.75.

The Bayshore Homes site was excavated by the Florida State Museum as part of salvage incident to a housing development. It consisted of a shell midden, two burial mounds, and a temple mound. Most of the shell midden had been previously removed. A single 10-by-10-foot test pit in the shell midden ridge was extended to a depth of 13 feet. A slightly aberrant form of Pinellas Plain pottery extended from bottom to top,

with greater frequency in the levels below a sterile sand stratum at 4.5 feet below the surface. Above this sand zone Glades Plain was present in some abundance. Small amounts of other plain wares and extremely small amounts of decorated types were present in various levels. Sears believes the contorted paste ware began to be manufactured in the Weeden Island II period and continued during the period that makers of southern pottery styles occupied the site.

The temple mound was excavated by power machinery incident to development of the site. It was built in two stages. The first consisted of a sand fill capped with a thick shell mantle, combined height about seven feet. It had a flat top and ramp extending towards the south. Stage II was again a sand fill capped by thick shell mantle. One burial was found alongside the ramp. The mound was evidently constructed during the later period of the site, as Glades Plain sherds were present in the fill.

Burial Mound B was the largest of the two burial mounds at the site and had been badly pitted by looters. Sears dug a ten foot trench nearly across the central section of the mound with a deep test to mound base in the center. The mound was constructed in two phases. The first consisted of alternating layers of shell and sand. The top was flat and Sears believes may have supported a charnal house. The second phase consisted of a mass burial on the southwest slope. Sixty burials were stacked one on another, perhaps 500 for the whole mound. During covering of these burials to form the final mound stage, more burials were added on the northeast side and probably other parts as well. Burials were mostly tightly flexed but bundles, cremations, and single skull burial types also occurred. One dog burial was included in the last phase. Only random sherds accompanied the burials. This is what Sears has called a "Mass Burial Mound."

Mound C was a much smaller burial tumulus and was inadvertantly destroyed by grading operations in the development of the site. Sears concludes, from what he was able to observe, that it represents the "continuous use" type of burial mound with extended burials at mound base. Complicated-stamped, check-stamped, Weeden Island Zoned Red, and Weeden Island Incised vessels accompanied the burials. Sears places it in the Weeden Island Period and suggests it may have been slightly earlier than Mound B.

In his concluding sections Sears suggests the chronology of the site as being a first Weeden Island period village oriented around the midden along the bay. The two burial mounds suggest some change in burial ritual during this occupation. The second phase, marked by Glades Plain pottery and the temple mound, he regards as pre-Safety Harbor with a strong southern infusion of traits or population. While the midden marks a common village area for the two phases, the focal center in Phase II was in the plaza in front of the temple mound. Sears believes the temple mound complex spread down the Florida Gulf Coast before Safety Harbor times. He presents little concrete proof for this postulate and ignores the Glades as a possible source of his platform mound. There are platform mounds in the Glades area and it seems, to me, that the Glades pottery and the temple mound may both have a southern origin.

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Geological Significance of a New Radiocarbon Date from the Lindenmeier Site. VANCE HAYNES AND GEORGE AGOGINO. Foreword by H. M. WORMINGTON. Proceedings No. 9, Denver Museum of Natural History, Denver, 1960. 23 pp., 5 figs.

Haynes and Agogino proceed to set up a correlation of stratigraphic cultures, fauna, and radiocarbon dates for a series of sites in the Southwest, using as a basis for comparison a radiocarbon date obtained from a charcoal sample they collected with the assistance of students from the University of Wyoming, and stratigraphic studies made of deposits exposed by the main arroyo and its tributary which cut across the northern edge of the Lindenmeier site. The date reported for Lindenmeier by Isotypes Incorporated is 8820 B.C. (10,780±375 B.P.).

In their consideration of the Lindenmeier site, Haynes and Agogino describe a series of unconformities with interspersed depositional layers and discuss their significance. The first unconformity, designated Z_3, is indicated by the fact that the Pleistocene sediments of the valley lie unconformably upon a greenish-gray Brule tuff of the Tertiary period. The layers immediately above record a period of deposition followed by a period of intense erosion which resulted in unconformity Z_3, which in turn was followed by a period of deposition with two units, then unconformity Z_2, another period of deposition and unconformity Z_1. The latter is particularly significant because the strata above it show a marked change in their characteristics resulting from the fact that the valley above the site had been beheaded. Another stream cut into and captured the drainage and as a consequence the chief source of water in the valley floor was springs rather than a stream that drained a much larger area. Also, the authors state that the cultural material representing the Folsom complex occurred on unconformity Z_1, a few inches below it and at least several inches above it, indicating that the occupation of the valley began at the end of an erosion period and at the start of a moist period. It probably has no bearing on the final conclusions but it should be pointed out that most of the materials I collected were lying on or were just above the Z_3 unconformity, that is the top of the Brule tuff. This was mentioned in several reports and also by Bryan and Ray in their paper on the geology of the site (*Smithsonian Miscellaneous Collections*, Vol. 99, No. 2).

Subsequent stratigraphy is described, but the features of main significance are unconformity Z_0, representing an extensive period of dessication and arroyo-cutting and

the following depositional stage. The charcoal dated 3070 B.C. (5,020±300 B.P.) a number of years ago by Libby came from a hearth at that level. The artifacts representing the occupation at that time are not diagnostic and do not suggest what cultural complex was responsible for them. The succeeding deposits and unconformities, while of interest geologically, do not have particular bearing on the problem of the earlier peoples who occupied the valley, but they do play a part in the comparisons made with the characteristics at other sites. The authors express the belief that the Folsom complex at Lindenmeier started near the end of the Two Creeks Interstadial and continued into the early part of the Valders Stadial. They place the artifacts suggestive of the Cody complex, also found there, in the latter half of the Valders Stadial. Other unidentifiable artifacts are referred to the Cochrane Stadial and the occupation represented by the hearths which were dated 3070 B.C. are placed in the latter part of the altithermal.

After their detailed consideration of the Lindenmeier site the authors summarize the finds at Blackwater Draw, New Mexico; the Lubbock and Scharbauer sites in Texas; the Lehner site and White Water Draw, Arizona; and the Grants area, New Mexico. An accompanying table shows the significant phenomena for all of the sites and indicates correlations between them. Both radiocarbon dates and geologic data concerning pertinent climatic events were used in determining the places where the phenomena appear in the table. In the latter, Blackwater Draw is erroneously assigned to Texas. On the whole it seems that Haynes and Agogino have presented a reasonable case for their conclusions, but it is possible that subsequent information may require shifting of some of the items in the various columns. Whether our knowledge is sufficient at this time to warrant so widespread an interpretation of the various cultural and climatic relationships may be questioned by some, but the effort made toward that end by the authors of this pamphlet is commendable.

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Wakemap Mound, a Stratified Site on the Columbia River. Oregon Archaeological Society, Publication No. 1, Portland, 1959. 38 pp., frontis., 22 pls., 3 maps. $1.00.

This is an attractive little brochure with excellent illustrations of Middle Columbia River art and other prehistoric objects. It is centered upon the now well-known Wakemap Mound first excavated by Strong, Schenck and Steward (*Archaeology of the Dalles-Deschutes Region*, University of California Press, 1930). The present booklet is a combination of reports on amateur work with a framework given by such scientific works as the above and, more particularly, on the recent extensive work of Caldwell and Osborne for the University of Washington. So far as I know the full reports of the last two have not as yet appeared. No author's name appears on the present work and it is hard to tell where the amateur's records and those of the professionals intermingle. The title indicates that Wakemap is a stratified site but little evidence of correlated cultural changes are here indicated. As it stands the main value of the present work consists of its very good illustrations, simplified maps, and, probably, on some specific references which it contains to sites now flooded or destroyed by amateurs.

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Contributions to California Archaeology, Vol. 3. Part I: An Investigation of Some Stone Mounds in Death Valley National Monument, California. W. J. Wallace, Alice P. Hunt, and J. P. Redwine. *Part II: A Preceramic Site at Saratoga Springs, Death Valley National Monument, California.* W. J. Wallace and Edith S. Taylor. Archaeological Research Associates, Los Angeles, 1959. 24 pp., 5 figs., 9 pls. $1.60.

Under a contract with the National Park Service, the Archaeological Research Associates, led by William J. Wallace of the University of Southern California, have conducted several investigations in Death Valley. Part 1 of this report is concerned with 97 stone "mounds" so far recorded in the central part of the Valley. They range from 8 to 18 feet in diameter, 1.5 to 3 feet in height, and contain some 200 to 250 cobbles 6 to 12 inches across. Seventy-three of the mounds occur in three groups along the lower edge of gravel fans where Indian trails (now roads) once ran. In these localities, which contain 20, 13, and 40 stone mounds, there are also numerous circular clearings or pits averaging 5 feet in diameter, with rock or gravel rims; there are 130, 78, and 18 of these, respectively, in the three localities of stone mounds just mentioned. The other 24 stone mounds are widely scattered.

Four mounds were systematically explored by removing the cobbles one by one, then replacing them after the earth was examined. At site 43–56, a cobble-filled pit under the mound was found to contain skeletal remains of an adult and child; 18 thin, delicately chipped projectile points and a few bone and shell artifacts were scattered among the rocks. Site 46a–56 likewise contained remains of an adult and child in a cobble-filled pit beneath the mound of rocks, but the two others which were dissected revealed nothing except one artifact. It is concluded that at least some of the rock piles were cairns erected to protect burials. Similarities in burial disposal and projectile-point style are seen with "Puebloid" material in southern Nevada and the estimated date for both complexes is A.D. 900–1100.

Part 2 deals with extensive trenching of a large, oval, partly looted midden near the edge of Saratoga Springs,

a warm, marshy lake at the south end of Death Valley National Monument in San Bernardino County. Here 488 artifacts found during several brief "digs" are described under such headings as projectile points, blades, drills, gravers, scrapers, choppers, hammerstones, milling stones and manos. Only five of the artifacts are bone, one is a shell bead, and one is an intrusive black-on-white potsherd. The only burial was that of an infant flexed into a small bell-shaped pit. Recovery of 3249 stone flakes as well as bird and animal remains shows that the site was a workshop area as well as a favorable place to camp in what is now very barren desert except for the oasis of the small lake and the nearby Amargosa River, an intermittent stream. Wallace and Taylor postulate that the site was occupied during a somewhat moister phase of climate, and that there may even have been rudimentary floodplain farming at that time; but the present oasis would seem to provide reason enough for the accumulation of a fairly dense midden.

A single "occupational phase" is indicated by the artifacts, which bear many resemblances to what M. J. Rogers designated Amargosa II in 1939. The authors state that this phase should now be dated at about A.D. 900–1100 through association with Anasazi sherds, and they think that Saratoga Springs may have been occupied by Amargosa II people who followed the river of that name from Nevada toward Death Valley. This agrees in estimated dating with the stone "mounds" in central Death Valley, hence a general linking up of the mounds, Saratoga Springs, Amargosa II and southern Nevada "Puebloid" is indicated.

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Archeological Explorations in the Region of the Frailesca, Chiapas, Mexico. CARLOS NAVARRETE. Papers of the New World Archaeological Foundation, No. 7, Orinda, California, 1960. ix + 43 pp., 49 figs. $2.00.

This report continues the publication of the research done under the auspices of the New World Archaeological Foundation in the Central Depression of Chiapas, Mexico. The project reported here consisted of reconnaissance and limited test excavations conducted by Navarrete in the winter of 1959 in the Frailesca subregion of the Central Depression. This subregion encompasses an area to the southwest of the Grijalva River, extending from the foothills of the Sierra Madre of Chiapas to a point about 10 km. short of the river. Several tributaries of the Grijalva cross the Frailesca, and the map showing the distribution of sites suggests that occupation centered along the courses of these rivers. The objective of the investigation was to compare the ceramics of the Frailesca with those of the Preclassic center at Chiapa de Corzo. This objective was achieved, and important data were also obtained about occupation of the area during the Late Classic and Early Postclassic periods, both of which are very poorly represented at Chiapa de Corzo.

The report presents brief descriptions of each of the 57 sites visited, as well as a listing of the ceramic classes encountered at each location. There are sketch maps of nine of the major sites, and a short discussion of the changes in architecture through time. The ceramic classes of each of the chronological phases are described, and adequate illustrations of rim forms are provided. The phase system used in the description of the ceramics is adapted from the 13 phase system developed for Chiapa de Corzo, but descriptions of the wares are independent, and based on the Frailesca material alone.

The Preclassic phases in the Frailesca were closely related ceramically to the Preclassic phases at Chiapa de Corzo, and the data for these phases will take on additional significance when the more detailed Chiapa de Corzo sequence has been published. During the Preclassic, the Frailesca reflected the general widespread contacts of the Central Depression with almost all the other major areas of Mesoamerica.

The Early Classic occupation of the Frailesca was very limited, but a great development of the subregion took place during the Late Classic and Early Postclassic periods. The Frailesca data for these periods are important, for material of this time range is almost totally lacking near Chiapa de Corzo. There was a tendency to a more regional and localized development, with a disappearance of most of the outside contacts which characterized the Preclassic. The only evidence of outside connections was an influence from Oaxaca and the Chiapas coast, which appeared in the Frailesca during the Early Postclassic period. It is interesting to note that the Frailesca remains show considerable continuity from the Late Classic period through the Early Postclassic period. The continuity of these two periods seems to be a widespread pattern in Central Chiapas, which provides an interesting contrast with the sharp discontinuity at the end of the Late Classic period in several neighboring areas.

A decrease in population at the end of the Early Postclassic was followed by an almost total abandonment of the Frailesca subregion during the Late Postclassic. Important Protohistoric and Colonial remains were encountered only at the town of Suchiapa, which is known from documentary sources to have been occupied by the Chiapanecs. Aside from Suchiapa, Colonial occupation of the Frailesca seems to have been restricted to haciendas serving as centers for the cattle and sugar production of the Dominican friars. Navarrete suggests that erosion of agriculturally productive soil, due to overpopulation during the Late Classic, may have been responsible both for abandonment of the region during the Late Postclassic, and the sparseness of Colonial settlement.

Each of the series of publications issued by the New World Archaeological Foundation is best evaluated in the light of the Foundation's total research program. The present report contributes data that will serve to

show the extent and regional variation in the Central Depression of material influenced by Preclassic Chiapa de Corzo. It also adds important data about the little known Late Classic and Early Postclassic occupation.

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Achados Arqueológicos num Sambaqui do Baixo Amazonas. Peter Paul Hilbert. Instituto de Antropologia e Etnologia do Pará, Pub. 10, Belem, 1959. 22 pp., 17 figs., 2 maps.

The archaeological sequences along the Amazon river are gradually being delineated, principally by Peter Paul Hilbert, who has devoted his efforts over the past decade to this task under the auspices of the Museu Paraense Emilio Goeldi and the Instituto Nacional de Pesquisas da Amazonia.

The paper under review describes a shell midden on the north side of the Amazon, a few kilometers west of the modern town of Alenquer. Located in a swamp, the site is inundated during the rainy season. The refuse accumulation is composed of rocks and shells. Stone and pottery artifacts and 175 potsherds collected from the surface by Frei Protásio Frikel between the years 1939–41 form the basis of the type descriptions. Pottery artifacts include 26 tubular pipes, the majority with incised decoration.

The pottery was classified on the basis of temper into three types. The majority (85%) is tempered with siliceous sponge spicules, known as *cauixí*; 5% is tempered with shell, and the remainder of the sherds contains both materials intermixed. Decoration is by brushing, incising or modeling. Motifs used in incised designs include zoned fine crosshatch, zoned parallel lines, unzoned parallel stepped lines, concentric squares, and squared spirals. Vessel shapes are simple bowls and jars with a direct rim. Lug adornos sometimes occur at the rim. Stone artifacts include squared axes with lateral notches, crudely shaped hammerstones, manos, and metates or mortars.

The tubular pipes that comprise the most unusual artifacts show the same range and relative frequency of temper varieties as the vessel sherds. Maximum length is 17 cm. Some are plain but others are modeled to produce anthropomorphic forms and decorated with broad lines and fine zoned crosshatch. The only other tubular pipes from the lower Amazon are the much smaller and cruder ones from the later Mangueiras phase, the second pottery-making complex in the sequence on the Island of Marajó.

Hilbert suggests that the two principal kinds of temper represent two archaeological phases, the earlier having shell temper and the later *cauixí* temper. Most of the decorative styles and the pipes are equated with the later Jauarí Phase. There is no clear-cut distinction, however, since examples occur of both pipes and decorated sherds with shell or shell-and-*cauixí* temper.

The major significance of this report is that it documents the existence on the lower Amazon of a site showing strong affiliations with the Ananatuba phase, the earliest pottery-making culture on the Island of Marajó. The zoned fine crosshatch decoration is identical to that characterizing Sipó Incised of the Ananatuba phase. Vessel shapes are also similar. Ananatuba phase pottery is tempered with crushed sherd, but *cauixí* is not native to Marajó so that this is not a significant difference. When the affiliations of the complexes on Marajó Island were traced, it was suggested that the Ananatuba phase was derived from somewhere up the Amazon. Hilbert's report is the first clear evidence in support of this inference. The detailed description and excellent illustrations make it a valuable contribution to our knowledge of Amazon prehistory.

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Tarukishi Remains. Hakodate Municipal Museum, Research Bulletin, No. 4, Hakodate, 1956. v + 53 pp., 34 pls., 7 tables.

Tachikawa: Pre-ceramic Stone Industries at the Tachikawa Site, Southern Hokkaido. Hakodate Municipal Museum, Research Bulletin, No. 6, Hakodate, 1960. 64 pp., 30 figs., 29 pls.

These monographs on preceramic sites in southwestern Hokkaido will interest archaeologists concerned with pre-Neolithic cultures in the Far East, and those who look for Asian prototypes or parallels for early assemblages found in northwestern North America. English summaries and captions on illustrations make both monographs useful to those who do not read Japanese.

Excellent drawings and photographs of nearly all the implements, detailed tabular summaries of types, and carefully drawn site plans and profiles that record the provenience of artifacts attest to the high standards of workmanship that were followed from the planning of excavations to final publication. These monographs were prepared by teams of specialists from several museums and universities; they represent the combined — and not always compatible — views of a number of leading Japanese archaeologists on the very intricate problems of pre-Jomon cultures in Hokkaido.

The Tarukishi excavations, carried out in 1954, were the first to demonstrate the presence in Hokkaido of a blade industry at a site for which reasonable antiquity could be claimed. The five authors report separately on their special interests. Shuta Takeuchi describes the preliminary survey, the organization of the team, and the manner in which records were kept, all of which indicate meticulous care in excavation. Masao Minato, in a discussion of the geology of the site, supported by maps and profiles of the terraces, shows that the artifacts came

from a residual clay layer in the third terrace from the top in a series of six. The artifacts were below a loam bed; the top of the soil profile had been disturbed by plowing. Minato correlates gravels, which at places near the site overlie the residual clay, with moraines of the second stage of the Tottabetsu glaciation (Tottabetsu II). He very cautiously suggests that the interstadial which preceded Tottabetsu II, to which the artifacts are attributed, may correlate with either the Würm I–II or the Würm II–III interstadial. Hiromichi Kono, Toshio Oba, and Takeuchi combine forces in the description of the artifacts. Of the aggregate of 72 specimens, 17 are classed as blades or flake-blades, 11 are tools (primarily scrapers) made on blades or flake-blades, three are called flake tools and two are "fabricators," said to resemble "boat-shaped tools." In addition there is a large core and 38 flakes. The terminology is adapted by the Japanese from that used in England. Oba, in a separate chapter, delineates the marked differences between these materials and the stone industries which accompany Jomon pottery of early styles. Sosuke Sugihara discusses the characteristics of the site and the Tarukishi assemblage, and proposes a classification of the artifacts which differs in some respects from the preceding one. His estimate of the position of the assemblage in the Japanese sequence confirms the relatively early date ascribed by the other authors on the basis of local comparisons. Kono adds a useful summary of literature on the preceramic archaeology of Hokkaido. In general, this monograph is a model of cooperative endeavor by independent scientists.

The main body of the report on the four "localities" of the Tachikawa site, not far from Tarukishi, is by Masakazu Yoshizaki. Masaji Ishikawa gives a history of the discovery of the site and the excavations, carried on in 1958 and 1959. Chosuke Serizawa, in a preface, describes succinctly the chronological problems of northern Japan and the relevance of the Tachikawa material to their solution. Shuryo Segawa's cautious study of the regional geomorphology is accompanied by maps of river terraces and diagrams of stream profiles. All of the Tachikawa localities are on the highest of a series of four dissected terraces of the Kombu River. The terrace complex is thought to correspond to that of the Tarukishi area. However, because all of the Tachikawa artifacts come from the upper part of a loam which appears to correlate with the top of the loam on the lowest terrace, Segawa concludes that the site can be assigned to the "uppermost Pleistocene or earliest Holocene." According to Yoshizaki's excavation profiles, the artifacts come from up to half a meter below an undisturbed, modern humus layer; no other natural stratigraphy was observed.

The four Localities (I through IV) yielded totals of 111, 30, 73, and 31 artifacts, respectively. Locality I is distinguished by tongue-shaped ("boat-shaped") microblade cores and microblades; these do not occur at the other localities. In addition, there are large blades made into scrapers and burins, but no bifaces other than the cores. Localities II and III produced an unusual group of projectile points with stems ground on their lateral and basal edges. Yoshizaki, who cites Wormington in his bibliography, should be credited with probably the first recognition of basal grinding on points from Asia. The collection from Locality IV consists mainly of large blades and blade tools; Yoshizaki equates it with the Tarukishi assemblage. Chiefly on the basis of typological comparisons of the four localities with a number of other sites in northern Japan, Yoshizaki concludes that they follow one another in the sequence I–IV.

This ordering, which by extension makes the Tarukishi material much later than the microblade industries, involves, as he himself admits, some radical changes in Yoshizaki's views on chronology. He formerly equated the Tarukishi material with that from Shirataki Locality 13, which he still considers to be earlier than any of the microblade sites in Hokkaido, a position in which he is supported by Serizawa and Ikawa in a recent publication. We are at present unable to assess the typological reasoning which separates, presumably by thousands of years, the blade industries of Tarukishi and Tachikawa Locality IV from that of Shirataki Locality 13; there should be more discussion of this in the near future. A statement from Minato on the current status of the geological stratigraphy and correlations at Tarukishi is urgently needed, for as the record now stands he appears to be in disagreement with Segawa; moreover, a combination of his 1956 views with those of Yoshizaki would make the microblades of Tachikawa come from before the interstadial preceding Tottabetsu II, an incredibly early date. This problem and others like it in northern Japan will probably be settled finally only by radiocarbon dates and further studies of archaeological and geological stratigraphy.

Whether these assemblages date from early or late in the Last Glaciation, their provenience in northern Japan marginal to the virtually inaccessible area from which Chard proposes to draw early Asian contributions to North American cultures should attract the attention of Americanists. Of significance here are the tongue-shaped cores, basally ground points, and special varieties of burins and possibly the blade industry. This material will also interest those who have noted the tendency of Russian workers to ascribe earlier dates to such sites as Mal'ta and Verkholenskaia Gora than previously. It is to be hoped that the producers of these very commendable monographs will make many more contributions to the internationally significant corpus of archaeological materials, and in addition turn their attention to more comparisons of their island assemblages and sequences with those of the mainland and of northern North America.

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NOTES AND NEWS

EDITED BY NATHALIE F. S. WOODBURY

ARCTIC

ALASKA. Last summer J. L. Giddings, Brown University, put in a third successful season at Cape Krusenstern, accompanied by his regular assistant on past campaigns, William S. Simmons III, and by Douglas Anderson who will do graduate work in anthropology at Brown University. The "Old Whaling" culture, discovered in 1959, was further investigated in three small settlements, the oldest of which occurred on the 56th beach inland from the present shoreline. This latter occupation consisted of a compact village of five deep and large pole-walled houses together with at least seven summer lodges of indeterminate form. The large houses appear to be unique. Their basic design is based on a plan of four posts, but the walls are rounded. Entrance passages are short, and from one to three side rooms adjoin the main room. This central room was heated by wood fires that were liberally doused with oil, and the result is a hard pan in the sand and gravel of the hearth areas. Small seals, as well as whales, seem to have been important in the economy of these people, and their sites are almost completely lacking in debris of bearded seals, walrus, beluga, and caribou.

Between the "Old Whaling" culture and the wide series of Ipiutak-related beaches Giddings found a number of intermediate cultures which are unlike anything hitherto described. For example, the Battle Rock knoll site, several miles up the coast from Cape Krusenstern, seems to derive partly from caribou hunters who practiced a bold art form that is distinct from previously reported Eskimo and Indian styles. One double burial, estimated to be more than 2700 years old, contained more than 300 arrow and spear heads of antler, a few sherds of linear-stamped or cord-impressed pottery, and some flint weapon points that anticipate Ipiutak. Other finds at Battle Rock included several phases of Ipiutak-like culture, including classic Point Hope with chains and openwork carvings.

Two settlements on Ipiutak-related beaches each contained a large, square house and four to five small house pits nearby. Four skeletons associated with one of these large houses may represent the victims of a raid who were trying to dig their way out under the wall beams when they apparently suffocated. The other settlement produced more than 70 pebbles etched with designs that suggest ideographic or mnemonic forms of message. None of the Ipiutak houses thus far excavated contained Point Hope Ipiutak culture in its precise form or content. Elsewhere in the area further collections were obtained on neighboring hillsides, as well as at the Palisades, and a thorough test was made in a large limestone cave inland from the village of Kivalina. In summary, Giddings reports that his past three seasons of work at Cape Krusenstern ". . . clearly show that a wide range of cultural types is to be expected in western Alaska, and that there is not likely to have been a time in the past when this coast was uninhabited by peoples of continuously changing culture."

The University of Wisconsin was active in southwestern Alaska during June and July of 1960. In collaboration with a party from Meiji University, Tokyo, directed by Professor Sosuke Sugihara, excavations were carried on for four weeks at the extensive Hot Springs site near Port Moller, originally sampled over 30 years ago by E. M. Weyer, and the only known site of consequence on the Alaska Peninsula. Two trenches covering 80 sq. m. were put down to an average depth of 2 m. in the midden deposit on the bluff in the vicinity of Weyer's pits, plus a third along the beach in the southwestern portion of the area which had not previously been investigated. A contour map of the site was also prepared. Four complete and two fragmentary human skeletons were recovered, and a considerable quantity of artifacts (514 bone or antler, 395 stone), together with charcoal, bone, and shell samples. With rare exceptions the stone artifacts were all chipped. This fact, plus the absence of any late harpoon types, suggests considerable antiquity for the site. Simultaneously with the above operations site surveys were being carried on by C. S. Chard in the Chignik area and along the western end of the Peninsula. Near Old Harbor, Kodiak Island, W. S. Laughlin located and sampled a large stratified village site at Sataq on Rolling Bay (Sitkalidak Island). Three burials of Palaeo-Koniags and an old-style lamp were recovered from the early level, and associated wood has been sent to the Copenhagen radiocarbon laboratory for dating. Further excavations are planned there for next season. Laughlin also visited sites at Three Saints Bay and Old Harbor.

The University of Wisconsin also sponsored a survey of points along the northern base of the Philip Smith Mountains (northeastern part of the Brooks Range) by Alan H. Coogan, who was attached to a geological party in that area. The vicinity of Sagavanirktok Lake and Echooka River, between the Shaviovik and Sagavanirktok rivers, was examined with negative results. No trace either of early or recent occupation could be located.

Ivar Skarland reports from the University of Alaska that his continuing archaeological survey of the Copper River–Upper Susitna region resulted in the location of several new sites, although no additional phases were discovered. Frederick Hadleigh-West was in charge of salvage work at Cape Thompson, the proposed harbor site for Project Chariot, and also along the right-of-way on the Kenai-Anchorage natural gas line.

YUKON TERRITORY. R. S. MacNeish, National Museum of Canada, excavated in three stratified and two open sites near Kluane Lake during the past summer. This now gives him a cultural perspective of that area which is based on a total of five stratified sites and 11 single

period components, and which includes some 2600 excavated artifacts and another 1500 from the surface. His attempt to bridge the gap between the old microblade culture and prehistoric Athapascan remains was not successful. However, in sub-microblade levels he enlarged his sample of Yumoid materials in association with bison remains, and in a still deeper stratum he discovered points and blades that appear to belong to the Cordilleran tradition. He has named these earliest finds the Kluane culture, and he notes that in terms of soil stratigraphy they occurred between the last glaciation and the Postglacial Optimum.

Devon Island, N.W.T. The interdisciplinary Arctic Institute of North America–Devon Island Expedition entered the field in 1960 for the first of four summer seasons, and among the eight members of the party were archaeologists G. R. Lowther and R. S. McCall of McGill University. In the 12 working days available two good sites were discovered, one in the vicinity of the base camp being a fairly rich Thule settlement consisting of four houses and associated structures. The other was found at Cape Sparbo, two miles from the site investigated by T. C. Lethbridge at Cape Hardy in 1937. In addition to numerous recent structures, this contained nine well-preserved houses, a large pre-Dorset assemblage, and possibly also Dorset materials. Samplings of the house middens yielded Thule artifacts. The pre-Dorset assemblage includes burins, microburins, blades and microblades, small serrated points, side blades, burin spalls, and a single end-blade. Lowther notes that this material is comparable to the Dismal 2 complex found by Harp at the western edge of the Barren Grounds, to some of the Ivugivik collection reported by W. E. Taylor, and also to the Igloolik assemblages discovered by Meldgaard. Lowther plans to return to this site next season and excavate it more fully.

During the academic year of 1960–61 Lowther is in residence at the National Museum of Denmark, Copenhagen, doing research as a Fellow of the Canada Council on the distribution and ecology of archaeological sites in Arctic Canada.

Baffin Island, N.W.T. During the month of August, 1960, Moreau S. Maxwell of Michigan State University, under contract with the National Museum of Canada, discovered and tested by limited excavation eight pre-Dorset sites on Juet Island and Okalivialuk Peninsula, 20 and 10 miles respectively southeast of Lake Harbour, Baffin Island. Two of these sites, KdDq–1 and KdDq–2, are stratified, each with three horizontal components. A total of 534 pre-Dorset artifacts was recovered. Preliminary typological and statistical analysis of this sample indicates that all of the pre-Dorset sites antedate the Sarqaq phase of Disko Bay, West Greenland. The Annawalk site, KeDr–1, appears to be typologically earlier than Ivugivik, the early pre-Dorset site reported by W. E. Taylor from the south shore of Hudson Strait. The Kilalugak site, KeDr–3, on the other hand, seems to be slightly later than Ivugivik and marks the appearance in force of the microblades industry in this section of the eastern Arctic. The Davidee site, KdDq–1, is next in time and shows an increase in quartz crystal artifacts as well as the development of the ground and polished "burin-like" tool from a hafted uniface and biface burin. The Sandy site, KdDq–2, still later in time, ushers in side-notched end blades, continues trends begun in earlier pre-Dorset levels, and provides important links with developmental Dorset. The sample from the Tiriak site, KdDq–4, is small but convincingly later than the other assemblages, although it is still within the early to middle pre-Dorset continuum.

Keewatin District, N.W.T. William Irving, University of Wisconsin, spent 6 weeks around the northern end of Ennadai Lake in company with a party of meteorologists from the University. Most of the material he discovered on beach ridges from 70 to 150 feet above the lake is similar to MacNeish's Lockhart River and Artillery Lake complexes. Analysis of the collection is not yet complete, but it appears that several different interior phases are probably represented in the region. There was no apparent continuity between camps of the recent Caribou Eskimos and very sparse early historic remains, found primarily in burial cairns. On a brief trip to Churchill, Manitoba, Irving located another site on top of a 150-foot hill near the I.G.Y. rocket-launching base, some 15 miles from the coast. The specimens collected there resemble Giddings' North Knife River complex and included a type of small round lamp, but this was the only occurrence of the Arctic Small Tool tradition that he found during the summer.

Godthaab District, West Greenland. From late June to the end of August, 1960, a party of five archaeologists and a pollen analyst under the direction of Jørgen Meldgaard represented the National Museum of Denmark in the Godthaab area. They were assisted by five Greenlandic and Danish teachers from the Godthaab Seminary. General operations were concentrated on sites of the Sarqaq phase which has previously been radiocarbon dated at about 800 B.C. in West Greenland. The most important locale investigated was Itivnera, a site that had been tested by Helge Larsen and Jens Rosing in 1958. It is covered by heavy peat layers which have acted to preserve organic material, and hence it is the first Sarqaq site to have yielded cultural remains in bone and ivory. The major part of the site was excavated and in the several dwellings, all somewhat disturbed, and middens about 1300 artifacts, 16,000 pieces of stone refuse, and 9000 animal bones, were collected. The stone culture is identical with other Sarqaq manifestations in the Disko Bay area, but the predominant raw material at Itivnera was quartzite, instead of the more customary *angmaq*, and implement sizes are therefore larger. The bone artifacts include handles for knife blades, end-scrapers, and for burin spalls; a few harpoon heads were also found. The animal bone debris has not yet been analyzed, but it appears to be about 90% caribou, with some representation of dog. Some 1200 samples for pollen analy-

sis were taken from the peat layers and culture-bearing stratum at the site, as well as from sediments in nearby lakes. Additional excavation was carried on at Nunguaq, which yielded a large number of stone artifacts similar to those found at Itivnera, although no organic material was preserved there. The dwelling type at Nunguaq, however, was clearly perceptible. It was large and rounded, with a central open fireplace built of a square fire box and cooking stones which were surrounded by a rectangular arrangement of more stones. Small, circular stone lamps for lighting were numerous here. Meldgaard notes that both Sarqaq and Dorset sites in this area are situated directly above present sea level. Except for the current sinking of the land at a rate of 1 to 2 m. during the past 200 years, there seems to have been little or no change in sea level within the last 3000 years.

Peary Land. Eigil Knuth has not yet filed a report on his 1960 field operation but, as in 1958, his work was supported by the American "Operation Groundhog" of the Air Force Cambridge Research Center. During this past season he planned to concentrate in the area around Centrum Lake in northeastern Greenland and expected to make a helicopter circuit of Danmark Fjord, Brønlund Fjord, Cape Morris Jesup, Herulfsholmstrand, Cape Ludovika, and Station Nord.

Assembled by Elmer Harp, Jr.

NORTHWEST

Intensive field work was carried out at many sites of this sector, which extends from southern Idaho and Oregon to the Pacific Coast of Alaska. In time, the finds range from around 8000 B.C. to the historic period. Evidence of great time depth continues to come in from sites in the southern part of this far-flung area.

Idaho. The laboratory analysis of the material culture from the Birch Creek rock shelters was carried out in the Idaho State College Museum during the winter months. B. Robert Butler served as laboratory assistant. The deep deposits of these sites, which at 10–CL–10 reach a depth of 6.3 m., produced detailed information on the cultural sequence and fauna as well as on soils and the geology of the locality. The earliest artifacts appear to be about 10,000 years old and are said to compare with early artifacts from the High Plains and from the Dalles. Charcoal for radiocarbon dating has been submitted to W. Libby at U.C.L.A. The project was supported by the National Science Foundation. Both in the Birch Creek rock shelters and in a series of specialized open sites in the Birch Creek valley, similarities to the historic northern Shoshoni culture pattern appear. These resemblances seem to extend well back in time. Additional work in this important region is planned for 1961.

A series of handax-like bifaces based on large flakes has been recovered from an extensive area of southern Idaho. So far, these artifacts float in time. A search is being made for a site which will reveal these unusual implements in their proper context.

The excavations at Wilson Butte Cave, a joint Peabody Museum of Harvard University–Idaho State College Museum project under the field direction of Ruth Gruhn, were completed in the summer of 1960. The cave, a large lava blister located on the Snake River plain of south-central Idaho, yielded evidence of human occupation embracing a time span of some 10,000 years. In some parts of the cave the deposits attain a depth of 3.20 m. The earliest artifacts occur in association with the bones of extinct camel, horse, and ground sloth. But even earlier human occupation is indicated by the presence in the underlying deepest stratum of camel and horse bones bearing the patterned scars of knife cuts. This basal cave deposit, a yellow-brown clay, is assumed to have been laid down in a moist period at the end of the Pleistocene. The chief game animal of the later occupants of the cave was modern bison. The projectile points range from lanceolate forms in the earlier stages to small corner- and side-notched types of the most recent period. Throughout the sequence cultural relations appear to have been closest with the Plains area, but *Olivella* and *Dentalium* shell beads in the latest prehistoric deposit indicate trade relations with the distant Pacific Coast. Funds for the project were provided by grants from the American Academy of Arts and Science, the Wenner-Gren Foundation for Anthropological Research, and the Idaho State College Research Programs Committee.

Oregon. Luther S. Cressman reports that field parties of the University of Oregon worked on various facets of the problem of Pacific Northwest prehistory in three widely separated areas.

Under a contract with the National Park Service, one party, directed by David L. Cole, Assistant Curator of the Museum of Natural History, continued the study of the John Day reservoir area of the Columbia River. Excavations were carried out at a site in Wild Cat Canyon, in Hobo Cave, and at a village site approximately a mile up the John Day River from its confluence with the Columbia. It is too early to generalize about the results, but it can be pointed out that certain patterns of cultural relationship both in space and time seem to be developing. No deposits of great depth such as the 30-foot deep midden at Five Mile Rapids farther down the Columbia River have been found. However, there appear to be areas which exhibit a preponderance of downriver similarity while others have their nearest cultural relations up-river and still others suggest an inland orientation toward the southern Columbia Plateau and the Northern Great Basin.

A second area of study was just south of the Oregon-California boundary at the Iron Gate Reservoir a few miles east of Hornbrook on the Klamath River. A grant from the California-Oregon Power Company aided this work. This is the second of a number of projects with COPCO and is tied in with Cressman's interest in the important problem regarding the role of the rivers that cut through the Cascade Mountains in coast-interior cultural and population relations. Two parties, both

under David Cole, worked at this site. The initial stages of the project were carried out before the John Day work began. After terminating the Columbia season, Cole and a party returned to continue the excavation of the village site. Unfortunately, extensive vandalism had been committed by collectors after the first period of work. One large house pit was relatively undisturbed, and work was concentrated on it. Later house pits dug into earlier ones indicate a succession of occupations of the site. Results of the first excavation suggested that different artifact inventories occurred with the different occupations. However, the sample was too small and this suggestion was not confirmed by the second excavation. Cressman and his associates assume that this village is Shasta, though further study of the data may necessitate a different conclusion. The site is approximately in the area where Shasta, Modoc, and Klamath territories joined.

News of a third major project launched by Cressman in Alaska will be presented at the end of this section.

WASHINGTON. Five archaeological crews from Washington State University under the general supervision of Richard D. Daugherty were in the field during the summer of 1960.

With support from the U.S. Army Corps of Engineers, excavations were carried out on a burial island in the Snake River. Two new burial patterns were discovered, both occurring in the early historic period: interment in the central section of a canoe, bow and stem having been cut off; interment in a narrow cedar box.

A second crew was employed in excavation, supported by the National Park Service, of a small cave, also located in the lower Snake River valley. The cave, with cultural deposits to a depth of 22 feet, yielded an abundance of stone artifacts, among them a series of projectile point types. Because of unfavorable conditions of preservation virtually no organic material was recovered. The data gained should help round out the cultural sequence in the area.

A third season of work was completed in the Sun Lakes area of central Washington under a grant from the Washington State Park and Recreation Commission. Excavations were at one open site and two rock shelters. None of the sites was particularly rich in archaeological materials, but the results will be of value in interpreting the prehistory of this little-known area.

Two survey crews conducted an archaeological reconnaissance along the 722-mile route of the Pacific Gas Transmission Company's gas line from the Idaho-Canadian border to the California-Oregon border. Later, survey crews will follow the ditching operations. Among the archaeological sites located one of particular interest just south of Bend, Oregon, was extensively tested. Evidently a campsite, the locality appears to have been occupied periodically over a long span of time. Projectile points, scrapers, and grinding stones were the most frequently encountered artifacts.

Plans for the summer of 1961 include the fifth and final season of work in the Ice Harbor reservoir on the lower Snake River, the beginning of a six or seven year program in the Lower Monumental reservoir of the lower Snake River, the excavation of several sites near Ephrata in central Washington, continued pipeline surveys, and the excavation of the site near Bend, Oregon.

Under the over-all direction of Robert E. Greengo, the University of Washington investigated in the interior as well as on the coast of Washington during the spring and summer of 1960. Assisted again by the Grant County Public Utility District and the National Park Service, the Summer Field School continued work in the Wanapum Reservoir on the Columbia River. In 1960, excavations were made near Lodge Pole Rapids, some 20 miles upstream from the scene of operation in 1959. Under the field supervision of M. Susia and S. Solland, two large house depressions, out of a series of 30 on the west bank of the river, were trenched. One cut revealed soil stratification representing at least two periods of occupation. Superimposed on an earlier stratum characterized by a house floor with a bench or step around the central floor area was a saucer-shaped house floor, characteristic of the late prehistoric and protohistoric peoples. Although there is no sharp break in the artifact assemblages associated with the two house floors, culture change is suggested by proportional differences in certain artifacts such as projectile points. Excavation in another house pit on the same site revealed a single occupation that was probably contemporaneous with the more recent of the two occupations discerned to date. Several test trenches were excavated at a similar house-pit site on the opposite bank of the river. This work was supervised by R. S. Kidd. Though some differences exist, a general correspondence with the later occupation on the west bank was noted.

A third excavation, directed by R. L. Emerson, was made in a rock shelter on the west bank of the river downstream from the house pit sites. Pothunters had thoroughly disturbed the surface layer which appears to have contained an abundance of organic materials. In the underlying deposit of basalt rockfall and windborne soil, Emerson's party encountered ash, charcoal, animal bones, and artifacts. The nature and distribution of the cultural remains point to intermittent occupation over a long period. Excavation reached a depth of over 3 m.; there was not sufficient time to probe to bedrock. Work on the site will be resumed in the summer of 1961. The artifact inventory recovered to date from the deeper deposit is meager, but projectile point fragments hint that complete specimens will resemble leaf-shaped forms from early sites in the Northwest.

Field parties working in the interior also copied the petroglyphs of several localities on plastic film and located and tested a number of new sites.

At Fort Simcoe State Park, C. A. Voucher continued his project of locating the foundations of historic buildings. In the course of trenching, some indications of prehistoric occupation of the area were noted.

Greengo also made progress on the coast. In the spring of 1960, he directed the excavation of a shell midden in the Skagit River delta. Students from Western Washington College of Education under Herbert Taylor

cooperated in the project. The complex of recovered bone and ground stone artifacts appears to be representative of a late period in the Puget Sound region.

In the late summer, Greengo assisted by R. S. Kidd, directed work on Sucia Island in the San Juan archipelago. Trenches were dug to a depth of 1.5 to 2 m. in two shell heaps of one site. Although the deposits appear similar in many respects, they contrast sharply in artifact content. One group is characterized by objects of bone and antler, with a few pieces of ground stone, including two labrets. Chipped stone is rare in this assemblage, while it is abundant at the other location, where, in turn, bone and antler are scarce. Similar complexes have been noted previously in the San Juans, but the degree of relationship and inferences to be drawn therefrom must await detailed analysis.

C. G. Nelson of the Washington Archaeological Society reports that members of the organization were active on three projects. For some time, work has been in progress at a large pit-house village site in the Wanapum Reservoir area of the Columbia, 8 miles south of Trinidad, the same area where the University of Washington has been working. Excavation of a succession of houses built on the same spot suggests a tentative sequence of three types of semisubterranean structures. The earliest type may date back several centuries. Circular to slightly oval in outline, these dwellings had a level area in the center surrounded by a flat bench about 2 feet high and from 2 to 3 feet wide. Behind this bench, the wall of the pit rose vertically to the surface. The second house type, in use evidently from late prehistoric to protohistoric times, appears to have consisted of a large pit with vertical wall and broad flat floor. The latest type, belonging to the early historic period, had a saucer-shaped floor with a stone-lined fire pit in the center. Further excavations at the site may furnish information on other structural details and on transitional stages of house development. Numerous artifacts, found in the midden fill and in association with the different types of dwelling, await analysis.

The Washington Archaeological Society is also conducting excavations at a prehistoric site in the Duvall-Monroe area of the Snoqualmie River valley. The permanently water-logged deposits of this site are producing not only chipped and ground stone artifacts, but also an abundance of organic materials of plant fiber and wood, including a wide variety of basketry, wooden fishhooks, and numbers of small oval stone sinkers provided with a loop consisting of a bent twig bound to the pebble with cherry bark.

A third project which the Washington Archaeological Society has under way is an excavation on the coast at 45–SK–33, the so-called Fish Town site north of the Skagit River delta.

British Columbia. In the summer of 1960, a field party under the direction of Charles E. Borden continued excavations at Fraser Canyon Site DjRi 3, a few miles north of Yale. Sponsored jointly by the University of British Columbia and the National Museum of Canada, the project received additional support in its second season from H. R. MacMillan of Vancouver and the Leon and Thea Koerner Foundation.

To date, the site has yielded some 6000 stone artifacts. Most of these come from a massive deposit of sandy loam which in places extends from the surface to a depth of 6 feet. Among the artifacts from this rich horizon are steatite carvings of animals and of the human figure. Stratigraphic evidence suggests that the earliest sculptures at the site antedate the introduction of ground slate knives which at a nearby locality are known to be present 2300 years ago (S–62). Radiocarbon analysis of charcoal found in association with an animal carving at the bottom of the sandy loam should give an approximate initial date for the complex.

Important additions were made to the assemblages of earlier occupation levels, previously assigned radiocarbon ages 7350 ± 150 B.P. (S–61) and 8150 ± 310 B.P. (S–47). Around 500 artifacts, in addition to large quantities of waste flakes, have been recovered from the latter. Chipped points in these levels are predominantly leaf shaped, pointed at both ends and vary in length from 5.5 cm. to more than 17 cm. They could have served either as projectile points or end-blades for knives.

During the final days of the field season, an even earlier occupation level was reached at a depth of 25 feet below the surface. Detritus, black ash, charred pits of a wild cherry, stake holes, and five artifacts, including a chipped point, were encountered in this earliest culture stratum. A charcoal sample has been submitted for dating.

Charred cherry pits are present in each of the three early levels. Unfortunately, no faunal remains survive. But it is probably significant that the season when these wild cherries ripen, the months of August and September, coincides with the time when the biggest salmon runs ascend the river. Cressman's finds of great quantities of salmon bone in cultural deposits of comparable age on the Columbia demonstrate that the rich food resources of the salmon streams in the Northwest were extensively utilized 8000 to 9000 years ago.

Burials with exceptionally rich inclusions were discovered in Shuswap Indian territory near Chase, central British Columbia. Most of the burial ground was quickly destroyed in an orgy of indiscriminate digging. In September 1960, a small party under the field direction of Peter Harrison, a graduate student at the University of Toronto, was sent to the site to carry out, if possible, systematic excavations. Some undisturbed areas were located and important information on burial patterns and other data were gathered. Most of the burials appear to be late prehistoric. A lively trade with the coast is indicated by the presence of whalebone clubs and numerous ornaments and other artifacts of shell. Some objects, such as digging stick handles and clubs are elaborately carved. The skeletal material from the site is being studied by Harrison, while David Sanger, a graduate student at the University of British Columbia, is preparing a report on burial practices. The project was aided by a grant

from the National Research Council of Canada to Borden.

During the summer of 1960, Catherine Capes of the National Museum of Canada conducted a site survey of part of the northeast coast of Vancouver Island.

From the fall to the spring (1960–61), Borden directed weekend excavations at Stselax, a recent Coast Salish village less than 4 miles from the U.B.C. campus. Archaeology students and members of the U.B.C. Archaeology Club are participating in the project, which is supported by the U.B.C. Committee on Research.

At its last session, the British Columbia Legislature passed an Act for the Protection of Archaeological and Historical Sites, which, it is hoped, will help prevent the recurrence of such archaeological atrocities as were committed at the Chase burial ground. It is now illegal and punishable by fines, imprisonment, or both to excavate or knowingly alter an archaeological site in British Columbia, unless authorized to do so by a Government permit issued under the Act. In view of proposed large-scale power developments on the Columbia and in other river basins of the Province, Section 10 of the new law is especially significant. It provides "for adequate investigation, recording, and salvage" of archaeological remains whenever sites are "threatened with destruction by reason of commercial, industrial, or other activity." British Columbia is the first province in Canada to have such an act. Wilson Duff, Provincial Anthropologist, and Borden have been appointed to the Advisory Board which was set up to assist in the administration of the new law.

Pacific Coast of Alaska. In addition to the archaeological research being carried out by the Department of Anthropology, University of Oregon, along the John Day and Klamath rivers, Luther S. Cressman initiated another major field program far to the north which will concentrate on interior and coastal sites of the Alaskan Peninsula, Kodiak Island, and Kenai Peninsula. The project, approaching Pacific Northwest prehistory from the north, was inspired by the study of the early artifact assemblage from the Five Mile Rapids site at the Dalles, Oregon, and its possible relations to assemblages from northern sources. The results of these investigations in Alaska may be expected to make significant contributions to problems concerning developmental processes and culture flow in the Pacific Northwest.

In the summer of 1960, excavations were begun in the Brooks Lake area of Katmai National Monument on the Alaskan Peninsula. The project was financed by a National Science Foundation grant and received aid from the Bureau of Commercial Fisheries of the Fish and Wildlife Service. Don Dumond, graduate student at Oregon, was in charge of the work. One single house, a complex of three connected rooms, and an extensive part of a large midden were excavated. The area was probably used mostly for fishing and land mammal hunting. Among the finds to date are three distinct types of pottery, both chipped and ground slate, flaked chalcedony, and artifacts made from an igneous rock.

In addition to the cultural data, pollen samples from both bog sources and exposed cuts were taken to aid in the reconstruction of the ecological succession in the area. When these profiles are constructed it will make possible correlation with the profiles from Kodiak Island and the Kenai Peninsula.

Antedating the Katmai eruption of 1912, there seem to have been two ash falls, both of which are thin but apparently wide spread. Samples of these are being analysed. If they can be positively distinguished and separately identified, they will provide excellent horizon markers for future work. Radiocarbon dates for both ash falls will further refine the chronological referents. A date for the later of these two falls can certainly be secured, but the sample of charcoal available for the earlier is very small. However, if the ash from the bog is identified as coming from the earlier fall, there will be adequate peat for a radiocarbon test.

Plans for 1961 call for a continuation of investigations in the Brooks Lake area and for a start of work at Karluk Lake on Kodiak Island. A reconnaissance of the latter area was made by Cressman, Dummond, and Brown in the summer of 1960.

Assembled by Charles E. Borden

CALIFORNIA

William Beeson of *Sacramento State College*, completed excavations in two caves near Ione, Amador County. College crews also mapped and excavated two relatively large bedrock mortar sites near Ione, and at one site found suggestions of patterns which might have temporal significance. An open site was tested in an area to be flooded by Camanche Dam in Amador County. A site survey program was continued near Ione, and a site survey was begun in the area of the North and Middle forks of the American River, Placer County. A survey was made of the west side of the Sacramento River in Yolo County, and a survey of the lower Bear River was completed. Excavations at the village site of Kadema, in Sacramento County, were completed. The work at Kadema was done in association with John Clemmer. Sacramento State College now has a complete and up to date record of the known archaeological sites for the 15 central California counties. The organization of these data has been done primarily by D. J. Theodoratus, who has also assisted Beeson in the college's archaeological field program.

Adan E. Treganza of *San Francisco State College*, in cooperation with the National Park Service, excavated three sites, Gln–10, 11, and 15, in Glenn County during the past summer. In addition, 97 archaeological sites, previously unrecorded, were found along Stoney Creek in Glenn County. Treganza's survey was aimed at a determination of the settlement pattern of the Nomlaki Indians of the ethnographic period. Archaeological surveys, also for the National Park Service, were undertaken by Treganza along Chapman Slough in Tehama County, and in the Spring Creek Reservoir area, Shasta County.

The Archaeological Research Associates, under the direction of William J. Wallace of the University of Southern California, Los Angeles, spent a total of 33 man-days excavating a site (Palos Verdes 1) on the western slopes of the Palos Verdes Hills. The archaeological deposit, made up of a dark adobe clay soil containing shell and considerable rock, had a depth of about 30 inches. The artifacts found are like those found in late prehistoric sites along the southern California coast.

The archaeological activities of the *University of California Archaeological Survey, Los Angeles*, are as follows: During the summer R. J. Fitzwater directed excavations at El Portal in Yosemite National Park, under a contract with the National Park Service. The site (Mrp–181) was 9 feet deep; 23 burials and approximately 1000 artifacts were recovered. The site includes components related to Middle and Late horizons of central California. In August and September, 1960, Fred M. Reinman directed salvage excavations at sites in the Whale Rock Reservoir under contract with the State Division of Beaches and Parks. Five sites were tested and 500 artifacts recovered. One site had 9 feet of deposit. Further work in the area is being considered. San Diego Highway Salvage excavations, under contracts with the State Division of Beaches and Parks, were made during August and September, 1960. Two sites near the town of Encinitas were excavated under the direction of Claude N. Warren and Robert H. Crabtree. Archaeological investigations are being carried out at a site near Oak View in the Ojai Valley, Ventura County, under the direction of Roberta Greenwood and Margaret Susia, in conjunction with R. O. Browne of Oak View. A. Carol Lytton and R. J. Fitzwater have completed test excavations on the property of Laguna-Miguel Corporation in Orange County. Further work is planned. During September, 1960, Emma Lou Davis and A. Carol Lytton completed a survey of the former territory of the Mono Lake Paiute Band. Hundreds of artifacts were collected from 168 campsites in all life zones, from Upper Sonoran through Hudsonian. The work was conducted in conjunction with an ethnographic study of the few surviving Paiute living near the lake. Claude N. Warren replaces M. B. McKusick, now at the University of Iowa, as the senior archaeologist position in the UCAS-LA office. R. J. Fitzwater is now junior archaeologist. Archaeological site surveys, in connection with the *highway salvage program*, are being carried out by several institutions in California. Among those most active in this field work are the University of California Archaeological Survey, Los Angeles, the University of California, Santa Barbara, the Archaeological and Historical Research Committee of the University of Santa Clara, and the Interpretive Services Section of the State Division of Beaches and Parks. These surveys have recently brought to light a number of sites endangered by highway construction in Lake, Monterey, and Contra Costa counties.

Excavations at Sutter's Fort, Sacramento, were undertaken during the summer of 1960 by L. Arthur Payen, Philip Coleman, and William Hansen. Their work revealed portions of the original walls and floor of the fort and a well, the third one to be found by recent excavations. The project was made possible by a contract from the State Division of Beaches and Parks with the *Central California Archaeological Foundation*, Sacramento.

In August, 1960, a small rock shelter was excavated within the Frenchman Reservoir area, Plumas County. The work was done for the State Department of Water Resources by the *State Division of Beaches and Parks*. The field work was done by L. Arthur Payen, Philip Coleman, and David Boloyan. The artifacts indicate a protohistoric occupation of the shelter.

The State Division of Beaches and Parks let a contract to the *Central California Archaeological Foundation* for archaeological excavation at the Casa Grande site at Sonoma Mission, Sonoma. The work is being done by John S. Clemmer with the remains so far exposed indicating the usefulness of historic archaeology in the reconstruction of historic buildings. The rear wall of the adobe was located, and a number of specimens including fragments of both floor and roof tile, broken bottles, and dinnerware fragments were recovered.

Assembled by Francis A. Riddell

NORTHERN MISSISSIPPI VALLEY

Midwest Archaeological Conference. The fifth Midwest Archaeological Conference was held at Allerton House, Montecello, Illinois, October 14 and 15, 1960. John C. Mc.Gregor presided at the general session in which reports of the season's field work were given. The topical sessions on archaeology of the protohistoric and historic periods were organized by Moreau S. Maxwell. The sixth conference will be held in October, 1961, at Indiana University.

Illinois. The Illinois State Museum archaeological field party, directed by Joseph R. Caldwell, devoted a second season to the Eveland site, an "Old Village" Mississippian component adjacent to Dickson Mound State Park in Fulton County. In two seasons work, eight semisubterranean houses have been excavated. All were of wall trench construction and most were rectangular. One small building had a circular plan and another seems to have been laid out in the form of an equal armed cross, possibly analogous to the so-called "ceremonial maze," Feature 35 at the George C. Davis site, Cherokee County, Texas, described by Newell and Krieger (*Memoirs of the Society for American Archaeology*, No. 5).

A Southern Illinois University Museum field party excavated, under contract with the National Park Service, at the Gus Krebs site in the Carlyle Reservoir in Clinton County. The artifacts suggest that this was a Middle Woodland campsite with its closest ties to the cultures of the Illinois River valley. Only a few sherds of Jackson ware of southern affiliation were found; the bulk of the ceramic material was Havana ware, with some sherds of classic Hopewell ware. These data sug-

gest that the boundary between the Illinois River valley and the southern Illinois Woodland cultures was south of the Kaskaskia River. Surface surveys continued in the Carlyle Reservoir and bring to a total of one hundred the sites now known that will be inundated by Lake Carlyle.

For ten weeks during the summer, Elaine Bluhm conducted excavations of an historic Sauk village near Rock Island. This was a continuation of work started in 1959. The work was financed by the University of Illinois and a grant from the American Philosophical Society. Three additional houses were excavated, exposing most of the village pattern, and several burials. Houses in the village are arranged in a row along a low ridge parallel to the river, and are large rectangular summer-type houses, with vertical poles supporting walls which were probably covered with elm bark. Trade knives, axes, silver ornaments bearing makers marks, and other tools indicate the site was probably occupied about 1800, shortly before the establishment of Fort Armstrong.

Additional salvage archaeology was undertaken by Elaine Bluhm and Charles Bareis. Six sites were tested to determine the feasibility of more extensive work on the highway right-of-way, three in northeastern Illinois and three in northwestern Illinois. Four of the sites were Archaic. One near Joliet yielded a posthole pattern which may represent a shelter or part of a windbreak structure. The other two were Woodland. Test pits in each of these latter made it possible to determine the depth and extent of occupation before the sites were destroyed. A site near Rock Island was a small village of a Late Woodland group which contained Weaver pottery apparently from the Illinois River valley.

Five Hopewell mounds on the Illinois River bluff north of Kampaville in Calhoun County were excavated by Gregory Perino of the Thomas Gilcrease Foundation, Tulsa, Oklahoma. Mound 1, 80 feet long and 8 feet high, covered two primary mounds each having subfloor tombs. In addition to the tombs, burials were located in and on the ramps and in and on the mound floor. A third tomb was formed by notching between the two primary mounds. Burial associations in the tomb of Primary Mound 1 included a fabric wrapped copper adz, large and small pearl beads, and a projectile point. In the tomb of Primary Mound 2, another adz, pearl beads, a conch shell vessel, a cut human maxillary, and a Hopewell Zoned vessel were found. The central log tomb contained two rearticulated extended skeletons composed of bones representing four individuals. The evidence suggests that the tombs were used for several successive interments before the mounds were built. Mound 2 contained two tombs, one in a primary mound with flake knives and a conch shell vessel, and one in the secondary mound with burial associations including remains of a pearl-studded garment on an infant burial with four bear canine teeth in the neck region and two fabric-covered copper adzes. Mounds 5 and 6 were similar in construction to Mounds 1 and 2. Mound 7 covered an earlier mound representing a pre-Hopewell component. Hopewellians had excavated several graves into the earlier mound. Burials were extended and had, as associations, one Hopewell Zoned vessel and one square-base Marksville Zoned vessel with four conventionalized bird designs on its slightly lobed shoulders. A subfloor pit on the edge of the earlier mound, but central to the Hopewell mound contained scattered human bone fragments and a limestone platform pipe. Over 200 burials were found in the five Hopewell mounds. The pre-Hopewell mound contained seven stone slab-lined crematory basins and a number of slab-covered circular pits containing flexed burials, in, under, and outside the mound. Associated artifacts include grooved stone plummets, copper fishhooks, a conch shell fishhook, rolled copper beads, conch shell and pearl beads, galena cubes, and stemmed and notched projectile points.

Stuart Struever, University of Chicago, and a group of students continued work in the lower Illinois and adjacent Mississippi river valleys. Major effort was directed to the partial excavation of the Snyders site, Calhoun County. Preliminary analysis of the artifacts reveals two components: one Middle Woodland (Hopewell), the other Late Woodland (Jersey Bluff focus). Stratitests were made in deep refuse deposits along one edge of the site to recover data applicable to chronological problems. Some 28 storage-refuse pits were excavated in the habitation area, some Middle, other Late Woodland in origin. Under excellent digging conditions it is notable that the excavated area (55 by 75 feet) disclosed only infrequent, scattered postholes, none giving any suggestion of being part of a house pattern.

In cooperation with the Illinois Division of Highways, members of the Illinois Archaeological Survey conducted several important salvage projects in the Cahokia area during 1960. Preliminary testing was undertaken in the spring and final salvage work was done during August, September, and October. Excavations were limited to the highway right-of-way and adjacent borrow pits.

An Illinois State Museum project, directed by Warren L. Wittry, was in a village area 800 feet west of Monks Mound. Remains of 131 houses, divided about equally between an earlier "Bluff Culture" occupation and Mississippian, were found. Four large circular structures, one 50 feet in diameter and three measuring 80 feet in diameter, were uncovered. Of special interest is the discovery of a rectangular compound of circular structures, each 10 feet in diameter, connected by a wall at average intervals of 18 feet. Doors or entranceways faced to the interior of the compound. The excavation uncovered the eastern side of the compound which lay within the right-of-way, revealing a north-south dimension of 180 feet. Features, numbering 465, were mostly pits of the storage-refuse variety. Two burials with pottery vessels, one with a galena bead, and ten with no associations, were found.

Working in an area 1.3 miles west of Monks Mound, the University of Illinois uncovered about 50 structures (both ceremonial and domestic), 145 refuse pits, three burials, and a number of miscellaneous features which

included corn baskets, fire basins, and pits for obtaining pottery clay. Structures were usually set in shallow pits and were either square, rectangular, or circular in outline. The most typical was the wall trench structure, rectangular in shape, ranging from 20 to 60 feet in length, and oriented either NW-SE or SW-NE. Artifacts uncovered consisted primarily of potsherds and chipped flint specimens. The ceramic complex included Bluff, Old Village, and Trappist materials as well as trade sherds from the lower Mississippi Valley and the Caddoan area. One unique aspect of the chipped flint assemblage was the recovery of a large number of microdrills as well as the cores which were used in their preparation.

A small village area at St. Thomas in the Mitchell area north of Monks Mound was tested, but the cultural remains, mainly Trappist, were extremely sparse and no houses were uncovered. The University of Illinois work at Cahokia was directed by Donald Lathrap and Charles Bareis.

Southern Illinois University Museum conducted excavations at Mitchell, 7.5 miles north of Monks Mound, under the field supervision of James W. Porter. The western half of the Mitchell site was excavated, consisting of two mounds in an area north of Long Lake approximately 370 m. square, and an area south of Long Lake measuring 160 m. by 100 m. In addition, the sediments of Long Lake were sampled. Preliminary analysis indicates that pottery from the Mitchell site is predominantly Old Village. Excavation procedures were designed to gain a picture of house distribution in relationship to the largest mound. Approximately 50 houses were found. House distribution indicates a sterile "street" area running westerly from the mound, at the end of which was found a large double wall trench building. This large structure measured 14 m. square with an entrance to the south. The sediments of Long Lake contained pottery and lithic materials discarded by the residents of the site. All materials recovered from Long Lake were in a perfect state of preservation. Lithic artifacts recovered through excavation include hoes, spades, projectile points, scrapers, celts, and microdrills. Thirty burned wood samples will provide adequate material for radiocarbon dating. Soil conditions were such that fragile and perishable materials were scarce, but small samples of the following were obtained: galena, muscovite, copper, shell, animal and bird bone, charred thatch, burned corn cob, and burned beans (?).

INDIANA. The archaeological field school at Angel Mounds was again conducted in cooperation with Indiana University. Seven students were enrolled. During the latter portion of the summer, experiments in the application of the proton magnetometer to archaeological problems were resumed. These had been initiated during 1959 with results completely inconclusive. A different version of the instrument was procured in 1960 and this one gives promise of favorable results. Those who may be interested in the application of this technique to archaeological problems are invited to write to Glenn A. Black, Angel Mounds, Newburgh, Indiana.

J. C. Householder continues to work on the highway salvage project in Indiana and, during much of the year, has worked on an interesting Fort Ancient-Woodland site near Indianapolis. In this latter undertaking he was joined late in the summer by Robert Kiste.

In September, James H. Kellar joined the faculty of the Anthropology Department at Indiana University taking the place of Glenn A. Black who resigned in May, 1960.

IOWA. Marshall McKusick has been appointed assistant professor and State Archaeologist at the State University of Iowa, replacing R. J. Ruppé, who is now at Arizona State University at Tempe. A Great Oasis site near Fort Dodge was excavated by Richard Flanders. Work at Effigy Mounds National Monument was conducted by James Anderson under a National Park Service contract.

MICHIGAN. A field party of Michigan State University, directed by Moreau S. Maxwell, conducted its second year of excavations at Fort Michilimackinac (1715–81). Additional features were worked out and sufficient artifacts found to determine statistically the difference between French and British trade goods. Particularly significant were additional numbers of artifacts of Indian manufacture, presumably historic Ottawa or Chippewa.

The Museum of Anthropology of the University of Michigan had three field parties excavating in the state during the summer of 1960. Funds were provided by the National Science Foundation, the National Park Service, the Graduate School, and the Museum. One field party on Isle Royale did an extensive surveying and site sampling. An intensive excavation program was carried on by another group at a stratified Late Woodland site in the Mackinaw Straits area. A group of 15 graduate and undergraduate students excavated a number of Late Archaic and Woodland sites in the Saginaw Basin. Analysis and interpretation of the materials is now in progress. The emphasis of the work is on a correlation of cultural and ecological changes in the Upper Great Lakes from the earliest appearance of man to the historic period.

MINNESOTA. Fieldwork of the University of Minnesota, under the general supervision of Elden Johnson, included both surveys and excavations. From June 15 to July 15, a survey of lower Prairie Island was made for the Minnesota Historical Society and the Northern States Power Company in an attempt to locate sites suitable for salvage prior to construction activities. The area is located in the Mississippi River bottomlands in Goodhue County and contains approximately 60 burial mounds in four separate groups and one stratified Woodland occupation site. Additional testing was done at the Bartron site.

The University's summer field session headquartered at Crookston, Minnesota, from July 15 to August 20 with 15 students in attendance. A Blackduck campsite and a Kathio burial mound overlying a Blackduck habitation site, both within late beaches of Lake Agassiz, were ex-

cavated. A second mound and another habitation site which are located outside the Campbell beach of Lake Agassiz were also investigated. The mound was sterile but the habitation site produced quantities of large percussion-flaked knives and scrapers probably associated with a middle stage of Lake Agassiz. Several pollen cores were taken in the area to supplement the archaeological record.

From August 21 to September 20, smaller parties, in cooperation with the North Dakota Historical Society, worked at Lisbon, North Dakota, excavating several probable Archaic sites and located a definite paleo-Indian site. Another party began work at two Archaic sites near Rosseau, Minnesota. Both areas will be centers of excavation in 1961. All University of Minnesota field work in 1960 was supported by a research grant from the National Science Foundation.

The Science Museum of St. Paul continued excavation of the Crites village site, a prolific Mississippian and Woodland site near Stillwater, Minnesota. The site, located on the second terrace of the lower St. Croix River valley, yielded over a thousand potsherds, a large number of stones, bone and shell artifacts, and several fireplaces. The latter portion of the summer was spent in preliminary excavation of the Fort Sweney site, a prehistoric site along the Cannon River at Welch, which contains evidence of 41 earth works. Dirt ridges almost enclose a group of burial mounds and there are several pits located on a high isolated knoll. The only skeletal material uncovered was that of a primary burial of a child. Grave goods consisted of 11 adult teeth grooved for suspension. Although previously described as a Mississippian site, the only pottery found consisted of five undecorated grit-tempered sherds. No stone artifacts or evidence of a palisade were found. The excavations were under the direction of Peter Jenson and Wilda Anderson of the Museum staff.

Missouri. The University of Missouri continued a full scale field operation throughout the summer of 1960 with two field parties in reservoir areas, a regular field school at the Archaeological Research Center in Lyman Field School at Van Meter State Park, investigation of the Lower Meramec basin, and investigation of Boone focus mounds on the Missouri River. The reservoir investigations were in cooperation with the National Park Service under River Basin Surveys, with one party in the Joanna Reservoir Area on Salt River in north Missouri and another on the Osage River and its branches in the Kasinger Bluff Reservoir Area in southwestern Missouri.

In the Joanna Reservoir Area, the two most important findings were a small B-shaped house type associated with the post Hopewell Late Woodland manifestations in the area and burial mounds associated with this same group. Surveys in the Joanna Reservoir Area indicate that it is rich in sites and materials ranging from Early Man through the Late Woodland period. The work in the Kasinger Bluff Reservoir Area under the Missouri River Basin Archaeological Salvage Program centered around the numerous shelters used by the Indians in the area and was particularly productive of information about the last Indians to use the shelters, presumably the Osage.

The Archaeological Research Center and Lyman Field School at Van Meter State Park near Miami, Missouri, was in operation on a limited basis. The Research Station is a cooperative venture by the University of Missouri and the Missouri State Park Board. The Director of the Research Center and Field School, Robert T. Bray, is also State Parks Archaeologist, who reports that the old farm buildings have been removed from the Research Headquarters and that a new display building and a temporary Field School Dormitory are under construction. It is expected that five to ten students can be accommodated next summer session. Research and student training was concentrated on two portions of the Utz site (23SA2), more often referred to as the Missouri Indian village. Portions of nine large refuse pits were excavated. These produced large quantities of the typical Utz Oneota pottery and stonework. Considerable amounts of charred flint corn, beans, and squash seeds occurred as did several species of wild seeds. Bones of bison, deer, many small mammals, and fish were plentiful. A few isolated human bones were also found in the pits.

Nine burials were located and five were completely excavated. Four of those found were in the footing ditches of quonset and well-house structures currently being erected. The normal pattern of extended, supine burials placed singly and in small groups at random in the village area occurred. A single departure was noted in the form of a semiflexed prone adult without intentional inclusions. Two of the individuals were accompanied by French trade beads of glass and porcelain, tubular and conical beads of copper, and copper bracelets. A third was accompanied by a copper bracelet and a polished bone chisel.

Archaeological survey and investigation of the Lower Meramec Basin was made possible through a grant from the James Foundation. Survey and test excavations were conducted under the direction of Dale R. Henning. Evidence was obtained that indicates a spread of ideas and materials up the Meramec Valley from the St. Louis-Cahokia area to the Meramec Springs near St. James, Missouri.

Salvage excavation of two mounds north of the Missouri River near Jefferson City yielded some excellent information concerning the Late Woodland Boone Focus. One mound contained what appeared to be a crematory platform, but also had cremated burials, typical Boone focus pottery, and a pipe. The other mound contained a circular stone chamber with entrance to the south. Within it were cremated burials and typical Boone focus pottery vessels. Charcoal from both of these mounds should furnish dates on the Boone focus materials. The mound containing the stone chamber was built over an earlier mound which had a circular layer of stones covering the primary extended burials. No artifacts were associated with the earlier mound structure.

OHIO. The joint summer field work of the Ohio State Museum Department of Archaeology and the Department of Sociology and Anthropology of Ohio State University excavated an Adena mound located on the Greenbrier Farm approximately 10 miles east of Columbus. Situated on a low ridge, 500 feet east of Big Walnut Creek, the mound measured 56 feet in diameter and 5½ feet in height. Exploration was carried out in advance of a housing development. The excavation revealed 14 Adena burials, including two cremations. Twelve were in two irregular shallow depressions dug in the mound floor, and two were placed in the mound fill. All of the extended inhumations had been placed on, and were covered with, bark. Cultural remains in the mound fill and in burial association include stemmed projectile points, leaf-shaped blades, slate pendants, a flint reamer, a boat-shaped atlatl weight, an unengraved sandstone tablet, a cone and a hemisphere of hematite, and numerous moderately-thick to thick, plain, grit-tempered pottery fragments. The simple burial method and artifact assemblage suggest that the site represents an early phase of Adena. The work was carried on between June 20 and August 26 under the direction of Raymond S. Baby, assisted by Asa Mays, Jr., Robert M. Goslin, and nine students from Ohio State University.

WISCONSIN. Under the cooperative agreement between the State Historical Society of Wisconsin and the Wisconsin Highway Commission, survey of right-of-ways and intensive excavation of sites took place during the summer of 1960 under the direction of Donald L. Brockington. A. Dewey Buck, Jr., and William Wilson, surveyed 122 miles of right-of-way on 26 state and federal projects. Two sites warrent excavation in the summer of 1961.

A crew, under the direction of Joan Freeman, State Historical Society, spent the entire summer excavating sites in the proposed right-of-way of Highway 60 in Crawford and Richland counties in the Wisconsin River valley. The three sites excavated are an effigy mound group and two village sites which produced an abundance of Hopewellian and a few Effigy Mound artifacts. The Hopewellian material is much like that of the Trempealeau focus in Wisconsin.

A preliminary survey of the Kickapoo river reservoir area was undertaken under an agreement between the National Park Service and the State Historical Society. Twenty sites were found within the area to be flooded by the proposed building of a dam north of La Farge in Vernon County.

Joan Freeman and graduate students from the University of Wisconsin, in cooperation with the Polk County Historical Society, conducted salvage operations at a mound group near Balsam Lake in Polk County. Seven bundle reburials were recovered from one mound and portions of single reburials occurred in the other two mounds.

Work by the University of Wisconsin, State Historical Society, and Wisconsin Archeological Society continued at the Highsmith site, a Middle and Late Woodland village site on the Rock River in Jefferson County.

During the month of August, 1960, Lee A. Parsons excavated for the Milwaukee Public Museum and the Wisconsin Archeological Survey at Lizard Mound State Park near West Bend, Wisconsin, in order to make an in situ exhibit of a skeleton in one of the burial mounds. No professional digging has been done here in the past. The Wisconsin Conservation Department enthusiastically gave permission for this operation, and the project has been successfully completed. Four burial mounds were excavated: a panther effigy, a low conical, a tapering linear, and a high linear mound. The first three contained no burials, at the time of digging, but they did show some interesting structural features. The plain linear mound contained three important features: an adult female burial in semiflexed position, an infant burial, and a ceremonial fireplace or altar. These were oriented in a straight line approximately along the longitudinal axis of the mound. A permanent outdoor display of the adult skeleton was installed by the Conservation Department. This is constructed of concrete with a Plexiglass window.

The Neville Public Museum party, consisting of Ronald J. and Carol Irwin Mason, spent four months in the field locating and recording sites in Door County. Their major effort was directed to the excavation of an extremely rich, multicomponent, stratified site on the Lake Michigan side of the northern Door Peninsula. Tens of thousands of potsherds, and quantities of bone tools, chert projectile points, and other stone tools were recovered. An important Early Woodland component was discovered in place beneath a fossil beach that may relate to an unnamed post-Main Algoma Lake stage in the Lake Michigan basin. Other and later components were found in other sections (some stratified) of the site. These reflect occupation in Middle through Late Woodland times. A strong Oneota component, with both shell- and grit-tempered pottery, is also present. The observed stratification and the richness of the site should prove of great value in establishing a chronology for this area of northeastern Wisconsin. Material for radiocarbon dating was collected from critical areas.

Assembled by WARREN L. WITTRY

NORTHEAST

GENERAL. The summer of 1961 will find river basin archaeological salvage in the Northeast unable to meet its needs. Twenty-two reservoirs await surveys for authorized or beginning Federal dam projects, and limited salvage operations are possible in only one reservoir. In the field for site salvage will be New Jersey State Museum at Tocks Island Reservoir, New Jersey. This project is supported jointly by the Museum and The National Park Service. Federal funds are roughly what they have been the previous season. A substantial increase is being sought for the ensuing (1963) fiscal year.

Continuing research into purported Norse visitations to the coastal Northeast, three investigators last summer resailed a "reconstructed" last leg of Leif Ericsson's enig-

matic voyage of A.D. 1003. Basing their course on interpretations of sailing instructions and observations recorded in the Icelandic sagas, Charles Boland and Bernard Powell of the Massachusetts and Pensylvania state societies, and John Streeter, on August 6, 7, 1960, attempted to duplicate at approximately the same time of year, and in a sailing vessel with sailing qualities somewhat comparable to those of the Norse ships, the conditions under which Leif is supposed to have made his landfall. The trio sailed from Manchester, Massachusetts, eastward into the Atlantic to intercept at some point the supposed course of the Viking vessels as they came in from the northeast and the open sea. Sailing all day and all night, a landfall was raised shortly before dawn off Cape Cod, Massachusetts (Provincetown), under conditions approximating the record in the sagas. The trio continued westward to Plymouth Bay, where they anchored their sloop, the 38-foot *Candida*, while Powell and Boland rowed ashore in the "long-boat" (dinghy) to land where the Jones River enters Duxbury Bay at Rocky Nook. Boland feels that this site is at least as logical a contender for Leif's Vinland as several other sites suggested in recent years. Shoreline researches have so far been minimal, but some recent developments are: (1) A boulder near the mouth of the Jones River is reported to contain "mooring holes." (2) A small (8 inch) carved likeness of a human head in sandstone was found in the vicinity by a local youth. Authorities at the Smithsonian and at Harvard's Peabody who have examined the object declare it not typically Indian and suggest it might be Eskimo or Norse. (3) Boland has found that the celebrated "Norse Axe" now carried in the inventory of the reconstructed Colonial Howland House in Plymouth was found initially during excavations in 1942 in the foundations of the original John Howland House at Rocky Nook.

The Northeastern Chapter, Archeological Society of Maryland, organized and conducted an archaeological seminar in Northeast, Maryland, during the week of October 7, 1960. This stemmed from a realization that amateurs have an obligation and responsibility to preserve the record and may need additional training. With the guidance of John Witthoft, Pennsylvania Historical and Museum Commission, the program included: collecting and site finding, writing archaeological history from collections, excavation techniques, types of sites, and an outline of prehistory. George M. Reynolds, chairman of the chapter, reports it was a success and may be repeated in future years.

Recognizing that demands for archaeologists to work on historic structures and properties of national and local significance may increase in the future, the University of Pennsylvania has offered a course, "Methods and Problems of Historical Site Archaeology," during the 1960–61 school year. Given in the Graduate School of Arts and Sciences by the Department of American Civilization, it was open to students from the departments of History and Anthropology. It was taught by John L. Cotter on leave from the National Park Service.

MASSACHUSETTS. The Cohannet Chapter of the Massachusetts Archaeological Society continued excavations in the Middleboro area. A new site, Wapanucket 8, located about 1000 feet east of Wapanucket 6, is on what appears to have been an ancient shore of Assawompsett Lake. The cultural complex resembles Late Archaic but includes fluted points, similar to those from the Bull Brook site. Additional traits include "thumb-nail" scrapers and channel flakes from the fluted points. Hearths in the site have yielded charcoal. Another radiocarbon date has been obtained for Wapanucket 6. The sample from Burials 2 and 3, which also contained a polished slate, semilunar knife, four gouges, a plummet and sharpening stones, is dated about 2340 B.C. (4300 ± 250 years B.P., M–969).

NEW YORK. The New York City Archeological Group tested a number of aboriginal sites in the Pelham Bay area (Bronx County), but unfortunately found none to warrant detailed excavation. A small, disturbed site in Fort Tryon Park (New York County) was also explored. Salvage work was carried out at the Schurz site (Bronx County) and at the Bay Terrace site (Queens County) prior to their complete obliteration. A sizeable collection was gathered. The items recovered range from steatite vessel fragments to Early, Middle, and Late Woodland pottery; there is also a comprehensive assortment of projectile points. Features included a disturbed burial, a cache of deer antlers, and a stone-lined pit.

Harry Trowbridge continued his investigation of the American positions during the Revolutionary war and has located a number of sites, including redoubts (at Beacon, N.Y.) and the Ridgefield barracks in Connecticut.

Excavations at Lost Village, a privately owned historical reconstruction near Carmel, N.Y., have been carried out by Michael and Susan Cohn for Charles and Susan Zurhorst during the 1959–60 season. The purpose of the excavations was to throw additional light on the historically documented Wappinger (to 1754) and Pioneer-Cowboy (1763–83) settlements. Colonial artifacts found include chinaware, buttons, pipes, as well as some items which seem to represent the remains of loot from the raids of pre-revolutionary "Cowboys" on Hudson Valley farms. Indian remains indicate that the site was occupied in late Archaic times as well as by the Wappingers. The area is especially noteworthy because of the many physical features found, including 15 house sites, three charcoal-burning areas, storage pits, old roads, and culverts. Further excavations are planned.

During the 1960 field season, the New York State Museum and Science Service conducted excavations on five sites in central and eastern New York, ranging in age from Archaic to Late Woodland. The field party was directed by William A. Ritchie, who was assisted by Robert E. Funk, newly appointed Junior Archeologist at the sponsoring institution, John A. Feistel, graduate student at the University of Colorado, William T. Stuart, an undergraduate at George Washington University, and Carl S. Sundler. The major work was completion of the

settlement pattern study begun the previous summer on the Maxon-Derby site near Jordan, Onondaga County. More than 7000 square feet of this large site have now been uncovered, revealing thousands of postmolds and numerous other features and artifacts. Floor outlines indicate three structural forms for this site, oval, rectanguloid with rounded corners, and circular. The oval type was the largest, two fully excavated examples measuring 60 feet in length by 25 and 27 feet, respectively, in maximum breadth. A linear series of small fire pits extended along either side and other features of note were present. The two fully exposed rectanguloid floors were also of virtually identical size, being 35 by 25 feet in dimensions. Less uniform in size was the circular form, the three examples of which had diameters of 16, 18, and 22 feet, respectively. Although much overlapping of floor patterns occurred, the total artifactual material consistently pertained to a single cultural complex, the Owasco of a fairly early developmental stage. (A radiocarbon report on a 1959 sample is still pending.) The evidence would seem to indicate a more or less continuous occupation by a single sizeable group of agricultural people who shifted their dwellings about over a four-acre area, which was not palisaded. The data from this site add a new house form, the rectanguloid, to Ritchie's previous finds on Owasco sites, and it now appears that all three house types were in use by at least one fairly early Owasco group. The large, obviously communal, oval form may be prototypic of the later Iroquois longhouse in the same area.

Elsewhere in central New York the party excavated in two other Owasco culture sites, each representing a different, and much later, stage of this culture. The sherd series obtained will have a significant bearing on the problem of in situ Iroquois development.

At still another site in the same region, where further work is scheduled for 1961, a ceramic series was found in a 40-inch stratigraphic column, demonstrating for the first time in a single site, the transition from certain late Point Peninsula into early Owasco pottery types.

At the Garoga site in Fulton County, where Harrington made some excavations in 1905, the group discovered that apparently the major portion of this late prehistoric, Mohawk Iroquois, hilltop village was still undisturbed. Under protection by the owner for the last 50 years, the site may now be available to the State Museum for extensive investigation in 1961.

Working cooperatively with members of the Van Epps-Hartley Chapter, New York State Archeological Association, Ritchie and Funk participated in the excavation of an Archaic site in the Mohawk Valley, near Schenectady. A new phase of the Archaic, termed the Normanskill, is represented by abundant stone material which occurs in a dark soil layer averaging about 18 inches in thickness, covering more than an acre on an intermediate river terrace. The site was discovered through the removal for topsoil of some 39 inches of sterile alluvium. Hearths and burned stone features occur in the occupation stratum which has produced more than 600 artifacts, including numerous drilled and notched bannerstones, projectile points almost exclusively of the slender, side-notched Normanskill type, and an animal effigy pestle. A charcoal sample has been sent to Michigan for radiocarbon dating. Fifteen inches below the Normanskill culture stratum, and separated from it by sterile sand and silt layers, several small hearths have been found with associated Lamoka type points.

The Niagara Frontier Archaeological Project, sponsored by the Buffalo Museum of Science and the University of Buffalo, excavated parts of two sites in western New York during July and part of August. Marian E. White was in charge and was assisted by James V. Chism of the University of Kansas. Members of the field crew were Faith Karas and Attila Markus of the University of Buffalo. Five weeks were spent on the Nursery site, Erie County, where about 160 feet of palisade were traced and several refuse pits and burials were excavated. Although artifacts were scarce, the finds indicate that this was a prehistoric Niagara Frontier Iroquois village of the Intermediate Period of Iroquois development. A second site was worked briefly to determine its prospects for future excavation. The Waterport North site is located along Oak Orchard Creek in Orleans County and had produced surface material from both Archaic and Woodland occupations. No refuse deposits were found, but the subsoil showed a multitude of postmolds without any discernible pattern. Pottery and points recovered from the molds show some similarities to both Owasco and Late Point Peninsula.

PENNSYLVANIA. The Frances Dorrance Chapter of the Society for Pennsylvania Archaeology has continued field work at the Schacht site at Nanticoke, near Wilkes Barre. Jacob Gruber, Temple University, has been supervising the excavations of this large palisaded village of the latest prehistoric stage which is threatened with immediate destruction by urban expansion. The complex ceramic series at the site represents a local Munsee-like culture with a Shenk's Ferry flavor which was overrun by the Susquehannock. Most of the elaborate triple palisade has been excavated, and it is expected that construction will be delayed in order to permit further excavations in the village area.

Excavations at the Sheep Rock Shelter in Huntingdon County, directed by John Witthoft of the Pennsylvania Historical and Museum Commission, have penetrated to a depth of 14 feet, through 10 feet of Archaic horizons. A sparse scattering of flint tools is being found at these deeper levels. Much of last summer's work was devoted to refining the stratigraphic picture and to interpreting the major stages in development of the fill on the shelter floor. Anton Kovar, Pennsylvania State University, has begun a study of the pollen content of the stratigraphic sequence. John Guilday, Carnegie Museum, and Hugh Cutler, Missouri Botanical Garden, have continued analyses of the zoological and botanical remains from the site.

Several biotic changes reflected in the site have been correlated with the stratigraphic sequence.

The varied activities of the Carnegie Museum, Pittsburgh, as reported by Don W. Dragoo, include the recording of petroglyphs and three excavations. James L. Swauger and W. C. Reeves studied and recorded five petroglyph sites during the spring and summer of 1960: Francis Farm and Sugar Grove in Fayette County, Pennsylvania, New Geneva in Green County, Pennsylvania, and Table Rock and Timmons Farm in Ohio County, West Virginia. Sites were recorded by means of sketches, photographs in black-and-white and color, overprints, and latex molds. From the latter casts have been made to provide a permanent record of petroglyph designs.

Dragoo participated as Technical Advisor to the Delaware State Museum in the excavation of an Adena burial site along the St. Jones River near Lebanon, Delaware. From this important site excavated by Leon deValinger of the Delaware State Museum has come additional evidence for the actual migration of some Adena peoples from the Ohio Valley to the east.

Test excavations and a surface survey of the Moyseneck site in New Kent County, Virginia, were conducted by Dragoo and Neil D. Richmond during the summer of 1960. A large Archaic component plus several later pottery components were discovered.

John A. Zakucia, Field Associate of Carnegie Museum, completed the salvage excavation of the Chambers site in Lawrence County, Pennsylvania. Most of the work during 1960 was concentrated on the excavation of a Hopewellian mound containing three stone burial cists. Additional evidence for a village was discovered near the Delaware burial area removed during work in 1959.

As a result of growth of the several programs of the Pennsylvania Historical and Museum Commission, Anthropological and archaeological research has been made a separate division of the Commission organization, with John Witthoft as its head. W. Fred Kinsey III has been promoted to Chief Curator of the Pennsylvania State Museum, thus heading another division of the Commission's activities.

West Virginia. Effective July 1, 1960, appropriations were made available for the creation of a Section of Archeology within the West Virginia Geological and Economic Survey, and for the salary and expenses of an Archeologist. This has been filled by Edward V. McMichael. Survey and excavation, both salvage and otherwise, are planned for West Virginia, after an appraisal of work done to date in the state. In this latter connection it would be appreciated if anyone knowing of obscure, unpublished data relevant to West Virginia archaeology would forward it to McMichael, Section of Archeology, West Virginia Geological and Economic Survey, Morgantown, West Virginia.

New Brunswick. During June and July, 1960, the National Museum of Canada surveyed 26 sites in the St. John River valley and along Passamaquoddy Bay. Directed by Richard Pearson, and assisted by Janice Hurlbert and John Whyte of the University of Toronto, a small group excavated two sites on the St. John River, one of which was preceramic; one site on the Tobique River; and a fourth site, a shell midden, near St. Andrews on Passamaquoddy Bay. Sites mentioned informally by early investigators were examined and tested, and the major collections in the area were photographed. The season's work pointed out several problems, the most pressing of which is the clarification of the relationships of red ocher burials in the area. The burial sites and many habitation sites in the Fredericton area are flooded for eleven months of the year. The burials are not identical with the familiar red paint burials of adjacent Maine, but are most closely related to some from the St. Lawrence River area. The initial task of building a time sequence and relating the material to the well-developed frameworks of adjacent areas will be carried on in future seasons.

Ontario. In Peterborough County, the Royal Ontario Museum project at Serpent Mounds site under the direction of Richard B. Johnston was completed during the 1960 field season. Another auxiliary mound, of nine in the group, was trenched and found to contain a central mass burial much like that encountered previously in Mound I. A portion of a habitation area near the mound group was cleared revealing a burial, a number of postholes arranged in no evident pattern in the area exposed and two pits containing chiefly ceramic refuse. During August, survey and testing activities elsewhere around Rice Lake, in the Trent Valley and near Napanee (Lennox County) located a few other Point Peninsula and Late Woodland sites. The collection is now being studied.

Royal Ontario Museum excavations were also conducted by Walter A. Kenyon and Kenneth E. Kidd. Kenyon continued to investigate the Miller site, a Late Woodland occupation near Pickering. He also assisted Kidd in excavating an historic fort in the Lake Abitibi region.

As in the past three years, Selwyn Dewdney continued pictograph recording. He was sponsored again by the Art and Archaeology Division of the Royal Ontario Museum, by the Quetico Foundation, and helped also by the Wilderness Research Center in Minnesota, and by the Ontario Department of Lands and Forests. He recorded between 20 and 25 sites in Ontario, two of which were petroglyph sites and one a lichen scraping. He also did some work in Alberta, with assistance from the Glenbow Foundation.

J. Norman Emerson, of the University of Toronto, continued the excavation of a site near Marathon in cooperation with the National Museum of Canada. James Wright, of the latter institution, worked with James N. Anderson, University of Toronto, in the Donaldson site, a Middle Woodland manifestation in the Bruce Peninsula. They sought to obtain a sample of pre-Iroquois burials as well as village site material. Anderson and Lawrence Oschinsky, National Museum of Canada, began the analysis of skeletal material in the collections of the

University of Toronto's Department of Anthropology and the Royal Ontario Museum.

QUEBEC. A late preceramic and protohistoric site near Tadoussac was inspected and tested by Gordon Lowther of McGill University and William Taylor of the National Museum of Canada. A site was excavated on the Richelieu River by Charles Martijn of the National Museum of Canada with the cooperation of the Archaeological Association of Quebec. It is thought that this site was occupied 2000 years ago.

Assembled by ALFRED E. GUTHE

MIDDLE AMERICA

During the first half of 1960, death took three figures who have contributed significantly to Middle American archaeology: Manuel Gamio, Karl Ruppert, and Rafael Orellana. Stimulated by his teacher, Franz Boas, Gamio became an important pioneer in the development of more scientific excavation techniques in Mexico. Along with Isabel Ramírez Castañeda, he conducted the first really important arbitrary depth stratigraphic investigations in North America (as has been recently emphasized by Richard Adams, *American Antiquity*, Vol. 26, No. 1, p. 99) which clearly demonstrated the Preclassic–Classic–Postclassic sequence in the Valley of Mexico. Although most of Gamio's specifically archaeological work was pursued within the latter region, he also worked in Zacatecas and Guatemala, and, as Inspector General de Monumentos Arqueológicos (1912–15), was responsible for the excavation, care, and restoration of all important ruins within the Republic. Ruppert was one of the leading members of the great Carnegie Institution of Washington research team which for so many years dominated Maya archaeology. He is particularly well-known for his architectural investigations and studies at Chichén Itzá. Orellana was one of the most active staff archaeologists of the Instituto Nacional de Antropología e Historia for about 20 years. He worked in almost all of the important archaeological regions of the country, serving at various times as Jefe of the Teotihuacán and Central Mexican zones.

Middle American archaeology was well represented at two important European scientific congresses during the summer of 1960: the 34th International Congress of Americanists, Vienna, July 18–25, and the 6th International Congress of Anthropological and Ethnological Sciences, Paris, July 30–August 6. Of special interest during the former meeting was the opening, timed to coincide with the congress, of the new exhibition hall of the Museum für Völkerkunde, "Amerikanische Kulturen," which, among hundreds of outstanding pieces, prominently displayed the famed objects of precious stone and feather mosaic obtained by the Spaniards during and shortly after the Conquest of Mexico, as well as three Mixtec codices, one on loan from the Nationalbibliothek. A well-illustrated, scholarly monograph on the Mexican "treasure" collection, by Karl A. Nowotny, was distributed to the congress membership. A special symposium, *Pictorial and Written Sources for Middle American Native History*, chaired by Howard Cline and Paul Kirchoff, dealt extensively with the pre-Hispanic and Contact periods (papers by Nicholson, Jiménez Moreno, Bernal, Gibson, Ballesteros Gaibrois, Dibble, and González). In other sessions, a number of important papers on Middle American archaeological themes were delivered by Bosch-Gimpera, Willey, Digby, Anderson, Lehmann, Nuñez Chinchilla, Cook de Leonard, Coe, Baudez, Haberland, Colby, Nicholson, Burland, Girard, Kutscher, Schubart, Esteva Fabregat, Katz, and Evans and Meggers. One of the most important coördinated projects in New World archaeological history, the Institute of Andean Research's *Interrelationships of New World Cultures*, was reported on by Ekholm and Evans in a final plenary session of the Congress; the 1959–60 field results of the Mexican projects (A, B, and BB) were summarized by Evans during this session. At the same session, the president of the Congress, Robert Heine-Geldern announced that a small clay head, excavated some years ago by Jose García Payón at Calixtlahuaca under various undisturbed floors, is believed to be Roman, dating from about the second century A.D., and, if so, represents one of the best candidates yet found for an Old World-manufactured piece having reached the New World in pre-Columbian times. Middle American archaeology was much less in evidence at the Paris meeting, but Kidder II, Bernal, Nowotny, Cook de Leonard, Burland, Lehmann, Jiménez Moreno, and Nicholson presented papers dealing with the pre-Hispanic past of this area. In both Vienna, due to the courteous assistance of Nowotny, and in Paris, owing to the similar consideration of Lehmann, Middle American archaeologists attending the congresses had the opportunity of inspecting and photographing the extensive storage collections from Mexico of the Museum für Völkerkunde and the Musée de l'Homme.

It has long been recognized that a major problem in Middle American archaeology, apart from keeping bibliographically up-to-date (which *Abstracts of New World Archaeology* is designed to alleviate), is the prompt dissemination of information concerning new field projects and other studies. This problem is actually aggravated by two of the otherwise most favorable aspects of this field: the large amount of work going on at all times and the broadly international constitution of the personnel involved. This section is designed to provide the profession with as much useful Middle American archaeological news as possible, and the generous cooperation of so many busy archaeologists in supplying timely information on their latest projects is gratefully appreciated. However, the field is so vast and the amount of activity so great that it is recognized that only a portion of on-going projects can be reported here. The considerable time lag between receipt of the information and its appearance in print also creates a problem, one which is unavoidable. Any new source of Middle American archaeological information, therefore, can only be enthusiastically welcomed. Recently, two additional news organs have appeared, and an established one has

been revitalized. The latter is the *Boletín* of the *Centro de Investigaciones Antropológicas de México*. Founded in 1956, it appeared with some regularity until the summer of 1958, when it was temporarily suspended. Beginning in March, 1960, it has resumed its fairly regular appearance, under the editorship of Demetrio Sodi M.; not confined to archaeology, it has, however, devoted considerable of its new coverage to this field. Turning to the new arrivals, a very active Middle American anthropological news journal (mimeographed) appeared in May, 1960, *Katunob*, edited by George Fay, Department of Sociology and Anthropology, Southern State College, Magnolia, Arkansas. Four numbers have so far appeared, all containing considerable news of archaeological activities in Mexico. The other new addition to the Middle American archaeological journalistic ranks is the *Boletín* of the Instituto Nacional de Antropología e Historia, of which two numbers have appeared, containing valuable up-to-date news of the INAH's archaeological enterprises, the most extensive in Mexico. We extend a warm welcome to all three.

INAH *Boletín* No. 2 (October) contained news of interest to all archaeologists working in Mexico. The Departamento de Monumentos Prehispánicos is actively setting up the long-awaited *ceramoteca*, under the direction of Florencia J. Müller, designed to aid all students with their comparative ceramic studies.

West Mexico. In fall, 1959, and spring, 1960, project BB (Coastal Guerrero, Mexico; Principal Investigators: Charles F. Brush and Ellen Sparry Brush) of the *Interrelationships of New World Cultures* project surveyed segments of both the Costa Chica and the Costa Grande of Guerrero, east and west of Acapulco, respectively. Eighty sites were recorded and surface collections made. Private collections in Acapulco were also inspected. Four sites were tested. At Puerto Márquez Bay, just south of Acapulco, a pit was dug in a cultural deposit to a depth of 7.8 m., the lowest meter of which was nonceramic. It is believed that the occupation probably began sometime during the Preclassic and extended through the Classic and Postclassic periods. On a nearby hill, a shell deposit area was also tested, with negative results as far as artifacts were concerned, although it is believed the shell lenses were the result of human occupation. Near Zanja, on the Laguna de Nahuala, east of Acapulco, two strati-pits were sunk into a large mound; the ceramic material recovered was generally similar to that found at the Puerto Márquez site, but the ceramic column might begin earlier and end later. At San Jerónimo, a well-known site about 50 miles west of Acapulco, a deep 11-m. pit was dug in a large mound, the lowest levels of which yielded materials which probably date from the Middle or Late Formative. A short distance northeast of Zihuatanejo, farther west along the Costa Grande, the Barnard site was located, which consists of a plaza edged with low mounds, some of which were stone-faced. Remains of what appeared to be a cobblestone-lined tomb were encountered. Polychrome sherds and various metal objects were collected on the surface; many of the latter have been found and sold by the local inhabitants in recent years. A house mound was trenched and three small test pits sunk, out of which came sherds decorated in a variety of design-schemes, including polychromes. All indications point to a Late Postclassic date for the Barnard site.

During December and January, 1960–61, the second season of Project A (Central Pacific Coast, Mexico; Principal Investigators: Clement W. Meighan and H. B. Nicholson) of *Interrelationships of New World Cultures* was carried out. It was planned to concentrate on testing for earlier materials the most promising sites located between the mouth of the Río Santiago and Colima during the first season's survey (briefly reported, *American Antiquity*, Vol. 26, No. 1, p. 142). The UCLA party, directed in the field by Jack Smith, assisted by Robert Fitzwater, Robert Crabtree, Stanley Long, Mrs. Long, and Peter Gray, briefly tested two sites on the south Nayarit coast, Santa Cruz and Chacala, and surveyed a third, Boca de Chila; all the material found appeared to be late. Reconnaissance and test-pitting in the Valle de Banderas (Nayarit-Jalisco border) were frustrated by the impassability of the Puerto Vallarta road due to heavy unseasonal rains and operations were transferred to the Jalisco-Colima border area. Stratigraphic tests were made in a large shell mound near Barra de Navidad, Jalisco, the Morett site near Cihuatlán, Colima, and the Playa Tesoro site, near Manzanillo, Colima. These sites yielded materials earlier than those found in southern Nayarit, but their precise dating must await laboratory analysis. Further excavations are in progress, directed by Clement Meighan, with the assistance of Joan Meighan and Marcia Wire.

With the inevitability of extensive inundation and consequent loss to archaeology of the opportunity of investigating important regions of the Río Balsas basin due to the construction of the Infiernillo Dam, a INAH salvage program, directed by Eduardo Pareyón, was initiated in 1960 in the threatened areas along the Michoacan-Guerrero border. A number of sites with constructions and, occasionally, tombs were located (Cancita, Arroyo Grande, La Goleta, Pinzandarán, and others), and systematic ceramic surface collections made.

The third season of the exploration and consolidation of the prehispanic structure known as El Ixtepete, 11 km. southwest of Guadalajara in the municipality of Zapopán, was undertaken in early 1960 by the INAH in collaboration with the Instituto Jalisciense de Antropología e Historia. The work was directed by José Corona Núñez, who believes that the monument, which consists of six superposed structures of stone and earth, including adobe and roughly worked stone stairways, dates to the Classic period, coeval with Teotihuacán. Corona Núñez also investigated some prehispanic mounds (Las Fuentes) located in a new subdivision of Guadalajara.

Central Plateau. William S. Godfrey, Jr., of the Logan Museum of Anthropology, Beloit College, assisted

by four Beloit students and J. Anthony Pomeroy, University of Arizona, as dig foreman, conducted the second season of excavations at the La Magdalena site, Guanajuato. Godfrey is presently working on the report of his Bajío project, initiated in 1958.

The INAH's major project at Tula, Hidalgo, continued limited work in 1960, largely confined to completing reconstruction of the portico pillars of Mound B and the Palacio Quemado. During the construction of the small dam, Presa de Pitahayas, Hidalgo, some burials with offerings were encountered. Of special importance was the discovery of three Tohil Plumbate vessels one of them displaying remains of *al fresco* decoration.

On September 28, 1960, the scale model of the Templo Mayor of Tenochtitlán, which many attending the 1959 American Anthropological Association meeting saw in an unfinished state, was officially opened in the Museo Etnográfico located at the modern ruins on the corner of Seminario and Guatemala streets. Designed by Ignacio Marquina, it was executed by Carmen Castillo de Antuñez; the former has recently published a book summarizing his research in connection with preparation of the model, the first ever attempted of the best-described major Mesoamerican contact period ceremonial precinct.

At Teotihuacán, the INAH project started at the beginning of 1960 continued under the direction of Jorge Acosta, with Florencia Müller in charge of artifact processing. Work was concentrated on two areas, one in and around the Pyramid of the Sun, the other just south of the Pyramid of the Moon. The work within the Sun was completed, and a substructure in the plaza just west of the pyramid was cleared. On the west side of the Moon plaza, two staged, tablero-decorated substructures, Edificios 1 and 3, were explored. Five rooms attached to the south side of Edificio 1 were excavated; in one two great collars of greenstone and tecali beads were discovered. Clear evidence of the method of cribbed log roof construction was obtained here. The most important discovery consisted of numerous designs incised on the plaster floors and walls. The commonest was one which had a quadrangular layout with transverse divisions; also numerous were those which displayed a combination of three spirals ending in a long "tail." Acosta believes it highly likely that these designs represent different Teotihuacano games, perhaps the ancestors of *patolli*, so popular in central Mexico at the time of the Conquest. Further insight into the construction methods employed by the builders of the ancient city was obtained from clear evidence that the thick lime plaster which covered the battered walls of the structures was formed in molded sections, similar to the modern method. At the rear of Edificio 3, a multi-roomed "palace" complex was discovered, deeply buried under a thick rubbish concentration; the ceramics found in the latter deposit promise to throw valuable light on the utilitarian artifacts of the people who occupied this area after the abandonment of the great ceremonial structures.

In addition to the Teotihuacán project, during 1960 the INAH conducted more limited investigations at five Valley of Mexico sites. At Culhuacán, a small Aztec period substructure was explored, and two strati-pits were sunk. At Tlapacoya, stratigraphic tests were made near the hill in an area producing predominantly Middle Preclassic ceramics, including hundreds of Olmecoid and Type D figurine fragments. Near Coyoacán, a funnel-shaped cave in the Pedregal lava was excavated; a great quantity of animal bones (and a few human) were discovered, plus a quantity of sherds. Predominant among the latter was the red-on-buff "Coyotlatelco" type in various styles which represented an evolutionary series from Teotihuacán forms to those considered typical of the early Postclassic. In Tlatelolco, a salvage operation was initiated, necessitated by new construction works; preliminary exporations succeeded in locating a canal which bounded the ancient city. In Tepeapulco, Hidalgo, where Sahagún gathered so much of his priceless 16th century ethnographic data, a substructure with two distinct construction periods was explored. Dating to the end of the Classic, the familiar Teotihuacán type tableros were present on portions of the edifice. Smaller structures arranged around patios surrounding the principal building were also explored and reconstructed.

In addition to these official INAH activities, at least two other projects were undertaken during 1960 by non-Mexican archaeologists in the Valley of Mexico. Angel Palerm, of the Pan American Union, Washington, D.C., collaborating with students at the Escuela Nacional de Antropología, made a reconnaissance of the Texcoco area, which included limited testing. William Mayer-Oakes, Director of the Stovall Museum of the University of Oklahoma, surveyed and tested in the northwestern Valley, assisted by Larry Blankenship of the University of Oklahoma. Pennsylvania State University students, under William T. Sanders of that institution, also assisted in some of the work. The *tlateles* (artificial lake-shore islands) of the El Risco area, where Mayer-Oakes conducted a limited excavation in 1954, were further surveyed. Two sites believed to be salt-manufacturing stations were discovered, as well as a site which produced fragments of "salt pans" in apparent association with Toltec period ceramics. If this association is confirmed, it would extend the salt-making complex well back into the Early Postclassic period. Most of the *tlateles* in the Ecatepec region, farther north, yielded Aztec period ceramics. However, the Tulpetlac *tlatel*, in which a 3-foot strati-cut was made, produced only Classic period material. Another strati-pit was sunk at the site of Tecoalapan, in the Atizapan area, to a depth of 9 feet, which produced Classic ceramics in the upper 5 feet and Preclassic materials in the lower 4 feet. These materials are being analyzed, together with material excavated at El Corral in 1958, and should provide information on village level ceramics in the Valley of Mexico.

Articles in popular magazines in 1960 reported on possible Early Man finds in Puebla made by Juan Armenta Camacho, Departamento de Antropología, Universidad Autónoma de Puebla, at Tetela and Atepitzingo, municipality of Totomihuacán. They consist of four bones

of extinct Pleistocene animals bearing incised marks and many bone and stone implements, all found in a geological deposit (Valsequillo gravels) which is believed to antedate the final major ice advance of the Pleistocene, the Wisconsin. The most important single find was one of the incised bones, a 6-inch wedge of elephant pelvis bearing numerous lines which it is believed represent elephants, a tapir, and a bison (photograph and drawing in *Life*, August 15, 1960, p. 86). The University of Michigan radiocarbon dating laboratory is running tests on the bones to determine more precisely the age of these potentially very important finds.

News has also been received of the discovery, by Mexico City College faculty members and students, of mammoth bones and, nearby, human footprints in a layer of volcanic ash in a sandstone deposit near the village of Santa María, not far from Chignahuapan, in the Sierra de Puebla.

At Xochicalco, Morelos, during 1960, Eduardo Noguera, César Saenz, and Hipólito Sánchez of the INAH worked on the excavation and reconstruction of a substructure located southeast of the famed carved pyramid of the feathered serpent. The west and south faces of this structure were uncovered, together with a series of adjoining rooms. Resting directly on the floor of one of the rooms were found two plain yokes, a tenoned stone head, and, most importantly, a rectangular stone monument bearing four calendric glyphs with bar-and-dot numerical coefficients. Under the floor a secondary burial was discovered with an offering which included a Mayoid human face pectoral, two small stone figures in a style the discoverers believe is "Mezcala-Teotihuacán," obsidian blades and projectile points, and various Pacific Ocean shells. Further work was done in the small structures located on the east side of the Great Plaza, the south wall of the large excavated ball court was strengthened, and the exploration of a second ball court was begun. The latter evidences a later occupation, perhaps corresponding to Late Postclassic times.

A conference, financed by the National Science Foundation, to plan coordinated anthropological research in the Valley of Mexico was held at the University of Chicago, Illinois, June 6–9, 1960. Attending were Robert Adams, Pedro Armillas, Pedro Carrasco, Michael Coe, Edward Deevey, William Mayer-Oakes, René Millon, Román Piña Chan, William Sanders, Eric Wolf, and Monica Bopp. Although the scope of the discussions was not limited to the pre-Contact and Contact periods, much attention was directed to the problem of the origin and genesis of the specifically Valley of Mexico expression of Mesoamerican complex native civilization. The group attempted to inventory our present state of knowledge concerning basic environmental facts, land-use, distribution and types of settlements, major patterns of social control at different periods in the development of the Valley, and the connection between evidence contained in the protohistorical and historical sources with relevant archaeological, ecological, and demographic evidence. The group recommended that future coordinated research concentrate on the northeastern part of the Valley, in the Valley of Teotihuacán, and the vicinity of Texcoco. A two-stage plan for an integrated project, which would, in a sense, represent a methodologically up-dated continuation of Gamio's 1917–22 Teotihuacán project was discussed. To accomplish such purposes, the following projects were recommended: the establishment of a central file of aerial photographs of the Valley; the preparation of an adequate topolux base map of the Teotihuacán and Texcoco areas; the establishment at various key institutions of sample Valley ceramic collections; the preparation of topical indices and analytic break-downs of the important documentary sources; a systematic survey of unpublished data concerning environmental changes, patterns of land use, settlement patterns, and demography in the Teotihuacán-Texcoco area; and sponsorship of archival investigations directed to clarifying cultural changes in the Valley since the Spanish Conquest.

Oaxaca. During the spring of 1960, excavations at Yagul (briefly described in *American Antiquity*, Vol. 26, No. 1, p. 143), two Mexico City College student assistants, Ronald Mahoney and Richard Owens, were led by the foreman of the work gang to an extensive hieroglyphic inscription on the same rocks which have the Caballito Blanco paintings, after which the site is named. Attempts to reproduce the glyphs by rubbings and photographs were not very successful; however, satisfactory latex molds of some of the glyphs were secured. Experts on Monte Albán glyphic writing believe, based on inspection of drawings made from the molds, that the inscription dates to the Monte Albán II period.

A carbon sample collected March 1, 1960, by Charles Wicke in Tomb 33, Yagul, which contained a rich Monte Albán I–C phase ceramic offering, including an Olmecoid face-effigy cylindrical brazier and a tripod vessel with face-effigy supports, has been dated at B.C. 390 ± 275, through the courtesy and generosity of the Exploration Department and the Geochemical Laboratory of the Humble Oil and Refining Company, Humble Division, Houston, Texas (Run No. 1210, 1960). This date appears to square rather well with current ideas concerning the chronology of the Mesoamerican Preclassic, as well as with earlier radiocarbon dates for the Monte Albán sequence, specifically.

The 1960 Mexico City College Oaxaca archaeological program was continued with a ten-day excavation, under the direction of John Paddock, at Caballito Blanco in August, in which ten students on National Science Foundation fellowships participated. Paddock returned with two students in September to clean up certain details. A small mound was uncovered which turned out to be essentially a miniature of Mound J (the "Observatory") at Monte Albán, complete to the arrowhead shape and the diagonal, southwest-pointing orientation. Two distinct construction phases are evident; when the second, larger structure was built over the first, the corners were rounded without substantially altering the basic form.

Abundant Monte Albán II ceramics were found in and around the structure. Paddock now believes that Caballito Blanco may be a one period site of that phase and may represent either a suburb of Yagul or the place the Yagul population went after the I–C phase at Yagul, represented in Tomb 33.

The fourth INAH season of archaeological explorations in the Chinantla of northeastern Oaxaca was carried out by Agustín Delgado in 1960. The region surveyed was the Sierra de Juárez, today occupied by the Chinantec in the north and the Sierra (Ixtlán) Zapotec in the south. Three important tomb sites were located. One, near the Río Grande, consisted of a number of sunken patios; in front of the mound of the principal patio a cruciform tomb was found, previously looted, whose stuccoed walls were decorated with polychrome paintings in the style of the Mixtec codices. In San Isidrio, near Yolox, other looted tombs were encountered, with many scattered objects, such as obsidian ear-plugs, copper pincers, stone axes, and gold beads, still remaining. The most important discovery was a small terraced site on the Cerro Gucumaya overlooking the Arroyo Carrizal, a tributary of the Río Grande, south of San Miguel Malinaltepec and west of Yolox. On these terraces were found patios edged by house platforms; occasionally circular sweat baths, *temascales*, were also present. Of greatest interest was the finding of eight rectangular masonry tombs, oriented to the northwest, with niches in the side and rear walls. The tombs contained from two to eight extended skeletons of adults (around fifty were found in all), as well as occasional pieces of gray pottery of simple form in the niches. The skeletons exhibited interesting features of dental mutilation, cranial deformation, and osteological pathology. The stuccoed walls of Tombs 3 and 6 were painted, in various color schemes, with three types of designs: a group iconographically similar to the Mixtec codices, geometric *greca* motifs similar to those of Mitla, and rather "infantile" pictographic representations.

During the spring of 1960, Project B (South Pacific Coast, Mexico; Principal Investigators: Gordon F. Ekholm and Matthew Wallrath) of the *Interrelationships of New World Cultures* project was initiated, with survey and excavations being undertaken in the region around the lower Río Tehuantepec and Río Perros and eastward along the coast. Thirty-five sites were visited and surface collections made. Two sites, Cerro de la Bomba and Boca del Río, were tested. The former site is located a short distance north of Tehuantepec, on the west bank of the river; a 3-m. strati-pit uncovered an occupation extending from the late Middle Preclassic or early Upper Preclassic to Late Postclassic (Monte Albán V). The other site is located about 3 km. east of Salina Cruz, also on the Río Tehuantepec, only a kilometer from the coast; two strati-pits were sunk in the cultural deposit, which extends, to a depth of 4 m. Three distinct Preclassic zones were encountered, beginning in the Middle Preclassic at the earliest. A semi-maritime economy during this period is evident from the quantity of shell. Two upper cultural zones were assigned to the Classic, but this period is thinly represented. Although the Late Classic and the Postclassic are not clearly present at the Boca del Río site, two ceremonial centers on high river terraces near Tehuantepec were located: Rancho Laguna and Santa Teresa, consisting of central plazas with surrounding low pyramids. Surface materials indicated a Monte Albán V date for both sites.

Before leaving Oaxaca, it is worth noting that the well-known Museo Frissel de Arte Zapoteca in Mitla, which contains one of the most valuable extant Oaxacan archaeological collections, on September 1, 1960, became the official headquarters of the Centro de Estudios Regionales of Mexico City College, the original facilities in the city of Oaxaca being closed down at that time.

Veracruz-Tabasco. The INAH opened a large strati-trench on the south bank of the Río Pánuco, adjacent to the cut of MacNeish, penetrating to the waterline. The artifacts recovered are being analyzed. At Tajín, the work of the INAH was largely confined to further reconstruction of the Pyramid of the Niches. The materials excavated by the INAH from La Venta, subsequent to the Drucker-Heizer project of 1955, are being worked up for publication.

Lowland Maya Region. The leading student of colonial Yucatecan Maya literature, Ralph Roys, lately of the Carnegie Institution of Washington and now Research Professor in the Department of Anthropology, University of Washington, was honored, May 13, 1960, by the Seattle Anthropological Society at a banquet attended by 95 persons, held in conjunction with the Northwest Anthropological Conference. James B. Watson, on behalf of the SAS, presented to Roys an engraved plaque which read: "In appreciation to Ralph L. Roys for his contributions to Mayan Studies and his devotion to anthropology," a sincere tribute to one of the world's outstanding Mayanists, active in this field since 1906.

Two important new organizations for the advancement of Maya studies have been recently formed: the Instituto Yucateco de Antropología e Historia, Mérida, under the directorship of Alfredo Barrera Vásquez, which assumes the programs of various lesser Yucatecan institutions; and the Seminario de Cultura Maya, of the Universidad Nacional Autónoma de México, affiliated with the Facultad de Filosofía y Letras, directed by Alberto Ruz L. Mesoamericanists extend to these new Mexico centers for Maya research a warm welcome and wish them every success.

The Departamento de Monumentos Prehispánicos of the INAH, in collaboration with the state government of Tabasco, conducted in 1960 a season of exploration and restoration at Comalcalco, continuing the work undertaken there in 1956 and 1957 by Gordon Ekholm. Work was concentrated on the eastern group, or acropolis. A small two-staged substructure, with a stairway displaying a large stucco mask in the center, over which a later temple-bearing substructure of fire brick was constructed, was cleared and restored. A larger but similar substructure, with a series of seated stucco figures and

a stairway with stucco masks on the balustrades, explored by Ekholm, was further cleared and restored. In the Palace, also worked by Ekholm, some walls of fired brick were restored, as well as the pilasters on the west side. At the rear, the east patio was cleared. A pyramidal substructure was discovered, with an altar imbedded in the center of the stairway which still displayed figures and glyphs in stucco. Northwest of the Palace, a badly destroyed habitation building was explored. Work was also initiated on the lower portion of the temple annexed to the Palace, where the stairway was being cleared. As part of the restoration project, the exterior stucco decorations at the site were water-proofed, and the tombs found in past years were consolidated. A beginning was also made on the analysis of the ceramics found in the rubble of the structures. Two distinct occupation phases appear to be present at Comalcalco, a reconstruction based on the structure superpositions and the accompanying pottery. The earliest was a Late Classic phase, with appropriate ceramics, including figurine fragments of the hollow Jonuta type. The structures of this phase were constructed of a nucleus of earth covered with stucco, and occasionally decorated with figures and masks of the same material. The final phase, Terminal Classic or Early Postclassic, is evidenced by Fine Orange ware, incense braziers, and Plumbate sherds. The buildings of this period, in which tombs were occasionally built beneath the temples, were constructed of fired brick and were superposed over the earlier stuccoed structures.

Detailed word has not been received concerning the important Tikal, Dzibilchaltún, and Altar de Sacrificios projects, but it is known that all three were further excavated during 1960. At the last-named site, the Willey-Smith party discovered an earlier structure in Pyramid B–I, the single tall, terraced, red sandstone pyramid at the site. Since four Early Classic Long Count-dated stelae are located near the base of the stairway and Chicanel-like materials were found in the lower levels of the plaza, it is believed that the interior structure, an earth mound faced with mussel shells (so far unique in the Maya area), dates from the Late Preclassic. Willey reported on this and other finds during the 1960 season at the Americanist Congress in Vienna.

Two important ruins west of Altar de Sacrificios, in the Río Pasión drainage, were discovered in 1959. Although this news is somewhat belated, they have not been previously mentioned in these pages, and a brief summary is in order. Both discoveries were made by personnel of the Esso Standard (Guatemala) Oil Company during mapping and exploration operations in Exploration Right 39, Petén, Guatemala. The principal person responsible was the Esso geologist, G. L. Vinson, who has reported on his finds, with some illustrative material, in the March, 1960, issue of the *Exploration News Letter* of the Standard Oil Company of New Jersey. Both sites lie on a high scarp-block which runs west of Laguna Petexbatún, just south of the village of Sayaxché, Petén. The largest and most thoroughly explored has been named by Vinson, with the approval of Edwin Shook, Aguateca, after a nearby arroyo; it is situated 15 km. south of Sayaxché. The known portion consists of a main plaza surrounded by five principal temple substructures. A total of 16 stelae have been located, twelve bearing carved dates (for example, Stela 1: 9.15.10.0.0 3 Ahau 3 Mol) and four plain; all of the former and one of the latter have accompanying altars. The second site was named by Vinson, at Shook's suggestion, Tamarindito, after nearby Laguna Tamarindito, and is located 7 km. southeast of Aguateca on the same cliff escarpment. No stelae were found by Vinson and Talbert during their brief visit, September, 1959, but it is believed that some are probably present. The northernmost pyramid has a stairway, the risers of which are carved with both human figures and glyphs, one of which bears the uncertain Long Count date of 10.0.0.0.0. At least one other structure also has sculptured steps. Press of time prevented a thorough inspection of the site. Vinson believes that an "anomalous hill" to the north bears the most important ruins at the site; he discovered tumuli and plazas with walled structures near the base of the hill. Vinson has also briefly described two additional new sites, found by him in 1957, 10 km. southwest of Itzán at Lagunas Itzán, near an important northwest-southeast trending causeway, which passes by the southwest shore of the small Itzán lakes. These sites, which consist of pyramids around plazas, have not been satisfactorily investigated.

Two major discoveries of the 1960 season at Tikal were an early ninth cycle stela bearing over 200 glyphs, plus human figures displaying obvious Mexican influence, and a huge, 12-by 20-foot scene of a prisoner standing before a seated dignitary carved on an outcropping of bedrock below one of the causeways (now being called "The Lundell Sculpture," after its discoverer, the tropical ecologist, C. L. Lundell). The major digging project in the north acropolis was actively pursued. The mapping of the site continued; it is hoped to publish soon a map of the 9 sq. km., around the central plaza. The periods represented at the site are, after five seasons, gradually emerging. The Early and Middle Preclassic (Mamom) has hardly been encountered so far; no buildings indubitably belonging to this period have been located, but some ceramics which appear to belong here have been found. Knowledge of the Late Preclassic (Chicanel) occupation of the site is better; a large complex of buildings in the North Acropolis has been identified as belonging to this period. Some have stucco masks similar to those on Uaxactún's E–VII Sub. The transitional period between the Preclassic and the Classic is so far quite hazy; one vault may belong here. For the Early Classic, a great number of structures have been identified, including some still visible, and some tombs; in general, the buildings are similar to those of the same period at Uaxactún. Teotihuacán influence, as evidenced by trade pieces in the tombs, was important at this time. A fairly sharp break is evident between the Early and Late Classic.

The latter period saw the great apogee of Tikal; most of the visible architecture fits here. The problem of the collapse of the Classic is still formidable and is being carefully investigated. The Postclassic occupation of the site was more extensive than anticipated. Some Tohil Plumbate and crude incensarios similar to a late Yucatecan type have been found in house mounds, as well as re-used stelae in improper association (some upside down), demonstrating ignorance of the glyphs.

William R. Bullard, Jr., of the Peabody Museum, Harvard University, who did the mapping for the Altar de Sacrificios project, writes that, after completion of this project in May, 1960, he spent 3 weeks obtaining ceramic samples at the Topoxté site, located on an island in Lake Laxhá in northeastern Petén. The ceramics recovered generally resembled those of Mayapán and those which were current during the east coast Tulum period. The great importance of Topoxté lies in the fact that it is the only ruin now known in the Petén which has standing architecture of the Postclassic period.

At Chichén Itzá, the INAH finished the restoration of the platform of the Chican Chob ("Red House"). In addition, the roof combs of this temple and the Temple of the Three Lintels were consolidated.

Assembled by H. B. Nicholson

NATIONAL SCIENCE FOUNDATION

The following grants for archaeological or related research have recently been made by the National Science Foundation, Division of Social Sciences, Anthropology Program: Soil Analysis, $9500 for 1 year (S. F. Cook, University of California, Berkeley); Archaeological Exploration of a Maya Site, $37,000 for 2 years (G. R. Willey, Harvard University); Tehuacan Archaeological Investigations, $21,500 for 2 years (R. S. MacNeish, R. S. Peabody Foundation for Archaeology); Culture History of South Arabia, $14,600 for 1 year (G. W. Van Beek, Smithsonian Institution); Cultural Stability in the Upper Little Colorado River Drainage, $12,000 for 1 year (P. S. Martin, Chicago Natural History Museum); Interrelationships of New World Cultures, $32,300 for 1 year (G. F. Ekholm, Institute of Andean Research, Inc.); Statistical Analysis of Prehistoric Fabrics, $14,400 for 1 year (J. B. Bird, American Museum of Natural History); Archaeological Appraisal of Arkansas, $16,600 for 2 years (C. R. McGimsey III, University of Arkansas); Settlement Pattern in the Missouri Valley, $20,000 for 1 year (F. H. H. Roberts, Jr., Smithsonian Institution); Excavation of El Inga, Ecuador, $13,900 for 1 year (R. E. Bell and W. J. Mayer-Oakes, University of Oklahoma); Prehistoric Occupations of the Great Lakes Area, $35,000 for 2 years (J. B. Griffin, University of Michigan); Prehistoric Man in Shanidar Valley, $5100 for 1 year (R. S. Solecki, Columbia University); Archaeology of Tikal, Guatemala, $24,000 for 1 year (Alfred Kidder II, University of Pennsylvania); Interpretation of Peruvian Archaeology, $13,200 for 2 years (J. H. Rowe, University of California, Berkeley). Of the 26 grants made in anthropology at this time, 14 pertained to archaeology.

SIXTH INTERNATIONAL CONGRESS OF PREHISTORIC AND PROTOHISTORIC SCIENCES

The International Union of Prehistoric and Protohistoric Sciences will have its 6th congress in Rome from August 29 to September 3, 1962. Various excursions will be held to some of Italy's famous archaeological sites before, during and after the congress. The Secretary-General of the Congress is Luigi Cardini, Museo Preistorico Etnografico "L. Pigorini," Via del Collegio Romano, Rome, Italy. There are eight major sections to include all phases of archaeological research. Section VI is devoted to non-European prehistory. American archaeologists may present papers at this congress if they write to the Secretary-General for an invitation and pay the usual fees for membership. The United States needs representation at the meetings of this organization in order that American archaeologists may acquaint European colleagues with New World developments and learn of recent progress in Old World areas.

AAAS ANNUAL MEETING

The American Association for the Advancement of Science will hold its annual meeting in Denver, December 28–30, 1961. Because of the location of the winter annual meeting, the Southwestern and Rocky Mountain Division will not meet in the spring of 1962. Program Chairman for Section H at the Denver meeting is David M. Pendergast, University of Utah. The following symposia are planned: Civilizations in Desert Lands; Early Man in the Western United States; The Concept of Race; Applied Anthropology and/or Multi-discipline Approaches in Anthropology; Interdependence of Archaeology and Ethnology.

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